

B.Sc. PHYSICS

LOCF SYLLABUS 2026



Department of Physics

School of Physical Sciences

St. Xavier's College (Autonomous) Palayamkottai

Tirunelveli – 627 002, Tamil Nadu, India

Vision

To mould young men and women as leaders in all walks of life so that they may serve the people especially the poor and the oppressed of our nation in truth, justice and love.

Mission

To achieve a synthesis of academic excellence and the formation of character.

To ensure social justice through equity and access

To include the excluded for empowerment

To equip students with global competencies

To engage in relevant research activities.

To promote Lab to Land through the Outreach Programme – Student Training and Action for Neighbourhood Development (STAND)

SCHOOLS OF EXCELLENCE WITH CHOICE-BASED CREDIT SYSTEM (CBCS)**Undergraduate Courses**

While the Tamil Nadu State Council of Higher Education (TANSCH) came forward to introduce CBCS in all the affiliated colleges in Tamil Nadu in June 2008, St. Xavier's College had already introduced CBCS as early as June 2002 for UG courses and in June 2003 for PG courses. The aim of the Choice-Based Credit System is to provide ample choice of subjects to students, based on the weighted credit point system. This system offers the learners a chance to match their aptitude and interest with the subjects of their choice and learn at their own pace. Thus St. Xavier's College gives every student an opportunity to study his / her discipline - specific courses and pursue other courses from any other department simultaneously.

Essential Features of CBCS

Standardisation of degree courses to internationally accepted levels

Focus on skill-based curriculum

Emphasis on value education

Institution - Industry collaboration

Provision for earning more credits

Development of communication skills

Credit system

The credit system at St. Xavier's College (Autonomous) assigns weightage to courses based on the hours allocated to each course. Typically, one credit is equivalent to one hour of instruction per week. However, credits are awarded regardless of actual teaching hours to ensure consistency and adherence to guidelines. The credits and hours allotted to each course within a programme are detailed in the Programme Pattern table. While the table provides a framework, there may be some flexibility due to practical sessions, field visits, tutorials, and the nature of project work. For undergraduate (UG) courses, students are required to accumulate a minimum of 150 credits, as stipulated in the programme pattern table. The total number of courses offered by the department is outlined in the Programme Structure.

OUTCOME-BASED EDUCATION (OBE)

Outcome-Based Education (OBE) is a student-centric teaching and learning methodology that focuses on measuring student performance through clearly defined outcomes. For St. Xavier's College, with its commitment to excellence and NAAC/NBA accreditation requirements, OBE is not just a regulatory expectation but a pathway to academic quality, global competitiveness, and improved employability of graduates.

We prepare students to meet future industry requirements and reinforce St. Xavier's College, Palayamkottai, as a leader in quality higher education. St. Xavier's College introduced OBE in 2018, and for the Attainment Calculation, we developed our own method in 2018. From the academic year 2025-26 onwards, in examinations, for each question we mark Course Outcome (CO), Competency and Performance Indicator, Programme Outcome / Programme Specific Outcome, Bloom's Revised Cognitive Level and we follow the OBE procedure for the calculation of the Attainment of Outcome for each student, course, semester, programme.

EVALUATION PATTERN (UG)**Continuous Internal Assessment**

There is no internal minimum for any paper. However, Continuous Internal Assessment (CIA) is a

mandatory requirement for all students. A student must take at least one CIA test out of two tests and must fulfil at least one mode of assessment among assignments, quiz, seminars, etc., otherwise he/she will not be permitted to write the semester examination.

S.No	Component	Marks Allotted
1	I CIA Test	50
2	II CIA Test	50
	Total	100

The total CIA marks of 100 will be converted to 70 marks. An additional 30 marks will be awarded through other internal assessment components.

The Continuous Internal Assessment (CIA) consists of two component tests, each carrying 15 marks (15 + 15).

The final internal assessment marks will be calculated out of 100 (70 + 30). The obtained marks will be **converted to 50 marks**.

Semester (External) Examination

- The External Semester Examination will be conducted for **100 marks**.
- The obtained marks will be **converted to 50 marks**.

Question Pattern UG Semester Examinations Part- I & II & III (3 Hours)

PART	TYPE	Mark Distribution	Total Marks
A	MCQ	20X1	20
B	ALL	5X3	15
C	Either/or	5X7	35
D	3 out of 5	3X10	30
		Total	100

UG Semester Examinations Part- IV (2 Hours)

PART	TYPE	Mark Distribution	Total Marks
A	MCQ	5X1	5
B	ALL	5X2	10
C	Either/or	5X5	25
D	1 out of 2	1X10	10
		Total	50

UG Internal Examinations Part- I & II & III (1.30 Hours)

PART	TYPE	Mark Distribution	Total Marks
A	MCQ	6X1	6
B	ALL	3X3	9
C	Either/or	3X5	15
D	2 out of 3	2X10	20
		Total	50

UG Internal Examinations Part- IV (1.00 Hour)

PART	TYPE	Mark Distribution	Total Marks
A	MCQ	5X1	5
B	ALL	5X3	15
C	2 out of 3	2X7.5	15
		Total	35

Grading System

Range of Marks	Letter Grade	Grade Point	Description
90-100	A+	9.0-10.0	Outstanding
80-89	A	8.0-8.9	Excellent
70-79	B+	7.0-7.9	Very Good
60-69	B	6.0-6.9	Good
50-59	C	5.0-5.9	Above Average
40-49	D	4.0-4.9	Average
00-39	U	0	Reappear

PROGRAMME OUTCOMES (PO) FOR UG PROGRAMMES

Students of all Undergraduate Degree Programmes at the time of graduation will be able to attain the following:

PO1. Critical Thinking: Acquire the knowledge in the respective field and take informed actions.

PO2. Effective Communication: Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology.

PO3. Social Interaction: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional practice.

PO4. Effective Citizenship: Demonstrate empathetic social concern and equity centered national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.

PO5. Ethics: Recognize different value systems and apply ethical principles and commit to professional ethics and responsibilities and norms of different value systems.

PO6. Environment and Sustainability: Demonstrate the issues of environmental contexts and sustainable development.

PO7. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern IT tools including prediction and modeling to complex activities with an understanding of the limitations.

PO8. Self-directed and Life-long Learning: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of socio-technological changes.

Programme Specific Outcomes:

At the completion of the B.Sc. programme in Physics the Students will be able to

1. understand and experiment the basic concepts of Properties of Matter and Acoustics, Solar Energy, Space Science and Cosmology, Nuclear Energy, Heat and Thermodynamics, Electricity and Magnetism, Optics and Lasers, Mechanics, Non-conventional Energy Sources, Digital Principles, Electronics, Nuclear Physics, Fiber Optics, Quantum Mechanics and Relativity, Geophysics, Solid State Physics, Instrumentation, Reactor Physics, Nanophysics and Spectroscopy.
2. develop the skills on scientific programming through Programming with C and C++ and Microprocessor 8085 which will make them choose their career in wide spectrum of areas.
3. realise their dream on designing electronic appliances by themselves
4. harness the scientific ideas to reduce pollution by promoting non-conventional or renewable energy resources
5. gain confidence and move to higher studies

UG Science Programme Pattern
(With Effect from June 2026)

Sem	Part	Status	Sub. Code	Title of the Paper	Hrs	Cdts
I	I	Lang	26UGTL11	General Tamil – I		
	I	Lang	26UGHL11	Hindi – I		
	I	Lang	26UGFL11	French - I	6	3
	II	Lang	26UGEL11	Communicative English - I	6	3
	III	Core-T1	26UPHC11	Properties of Matter & Acoustics	6	6
	III	Core-P1	26UPHC12	Properties of Matter & Acoustics Practical	2	2
	III	EC-T1	26UPHE11	Allied – I (Mathematics)	6	5
	IV	SEC1	26UPHN11	Physics for Everyday Life (NME)	2	2
	IV	FC	26UHER11/ 26UHEE11	Foundation Course: Religion: Catholic Doctrine/ Ethics	2	2
					30	23
II	I	Lang	26UGTL21	General Tamil – II		
	I	Lang	26UGHL21	Hindi – II		
	I	Lang	26UGFL21	French - II	6	3
	II	Lang	26UGEL21	Communicative English - II	6	3
	III	Core-T2	26UPHC21	Heat & Thermodynamics	6	5
	III	Core-P2	26UPHC22	Heat & Thermodynamics Practical	2	3
	III	EC-T2	26UPHE21	Allied – II (Mathematics)	6	5
	IV	SEC2	26UPHN21	Nuclear Energy and its Applications (NME)	2	2
	IV	SEC3	26UHEI21	Integrated Personality Development	2	2
					30	23
III	I	Lang	26UGTL31	General Tamil – III		
	I	Lang	26UGHL31	Hindi – III		
	I	Lang	26UGFL31	French - III	6	3
	II	Lang	26UGEL31	Communicative English – III	6	3
	III	Core-T3	26UPHC31	Electricity and Magnetism	6	5
	III	Core-P3	26UPHC32	Electricity and Magnetism Practical	2	3
	III	EC-T3	26UPHE31	Allied Physics – I Chemistry	4	3
	III	EC-P3	26UPHE32	Allied Physics – I Practical	2	2
	IV	SEC4	26UHEL31	Life Issues & Entrepreneurial Skill Development	2	2
	IV	SEC5	26UPHS31	Space Science and Cosmology (Discipline Specific)	2	2
					30	23
IV	I	Lang	26UGTL41	General Tamil – IV		
	I	Lang	26UGHL41	Hindi – IV		
	I	Lang	26UGFL41	French - IV	6	3
	II	Lang	26UGEL41	Communicative English - IV	6	3
	III	Core-T4	26UPHC41	Optics & Laser	4	4
	III	Core-P4	26UPHC42	Optics & Laser Practical	2	2
	III	EC-T4	26UPHE41	Allied – II Chemistry	4	4
	III	EC-P4	26UPHE43	Allied – II Practical	2	2
	IV	EC-T5	26UPHE42	Discipline Specific - Mechanics	4	4
	IV	EVS	26UPHS42	Environmental Studies	2	2
	V	Extension Activities	26UEVS41	STAND(Student Training and Action for Neighbourhood Development)	-	1
					30	25
	III	Core-T5	23UPHC51	Electronics – I	5	4

V	III	Core-T6	26UPHC52	Quantum Mechanics	5	3
	III	Core-T7	26UPHC53	Digital Principles	4	3
	III	Core-T8	26UPHC54	Nuclear Physics	4	3
	III	Core-P5	26UPHC55	Electronics – I Practical	2	2
	III	Core-P6	26UPHC56	Digital Principles - Practical	2	2
	III	EC-T6	26UPHE51	Programming with C & C++	4	3
	III	EC-P5	26UPHE52	Programming with C & C++ Practical	2	2
	IV	VE	26UVEH51	Human Rights & Social Analysis	2	2
	IV	Internship	26UPHI51	Internship	-	2
					30	26
VI	III	Core-T9	26UPHC61	Solid State Physics	4	3
	III	Core-T10	26UPHC62	Nano Physics	4	2
	III	Core-T11	26UPHC63	Electronics - II	4	2
	III	Core-P7	26UPHC64	Electronics - II Practical	2	2
	III	Core-P8	26UPHC65	Instrumentation Practical	2	2
	III	Core	26UPHC66	Project with viva	6	3
	III	EC-T7	26UPHE61	Microprocessor 8085	4	2
	III	EC-P6	26UPHE62	Microprocessor 8085 Practical	2	2
	IV	SEC6	26UPHS61	Professional Competency Skill	2	2
					30	20
				TOTAL	180	140

EC – Elective Course

FC – Foundation Course

VE – Value Education

SEC – Skill Enhancement Course

Discipline Specific – Core and related discipline

Extra Credit Courses

1. 26UPH EC1 – Introduction to Solar Energy
2. 26UPH EC2 – Opto Electronics
3. 26UPH EC3 – Non-Conventional Energy Sources
4. 26UPH EC4 – Laser Physics
5. 26UPH EC5 – Astro Physics
6. 26UPH EC6 – Applied Machine Learning

Certificate Courses (Value Added)

1. 26UPH CC1 – Biomedical Instrumentation
2. 26UPH CC2 – Basic Electrical and Electronics Circuits

Add-on Courses

1. 26UPH AO1 – Domestic Electrical Wiring
2. 26UPH AO2 – Basic Physics for Beginners

பொதுத்தமிழ் - I
26UGTL11

Sem	Course Code	Course Category	Hours	Credit	MARK FOR EVALUATION		
					CIA	ESE	TOTAL
I	26UGTL11	GT	6 Hrs	3	100	100	100

COURSE TITLE	பொதுத்தமிழ் - I
--------------	-----------------

COURSE OUTCOMES: (பயன்கள்)

CO1	பாரதியார் காலந்தொட்டுத்தற்காலப் புதுக்கவிதைகள் வரையிலானகவிதைகளை அறிமுகப்படுத்துவதால் படைப்பாற்றல் திறன் பெறுதல் (K1, K2)
CO2	புதுக்கவிதைவரலாற்றினைஅறிந்துகொள்ளுதல்.(K2)
CO3	இக்கால இலக்கியவகையினைக் கற்பதன் மூலம் படைப்பாக்கத்திறனைப்பெறுதல்.(K4)
CO4	மொழிஅறிவோடுசிந்தனைத் திறன் அதிகரிக்கச் செய்தல்.(K3)
CO5	தமிழ்மொழியைப் பிழையின்றிஎழுதவும்,புதியகலைச்சொற்களைஉருவாக்கவும் அறிந்து கொள்ளுதல்.(K4)
CO6	காலந்தோறும் சமூகச் சிந்தனைகள் மாறுவதை இலக்கியவரலாற்றின் மூலம் புரிந்துகொள்ளுதல்.(K6)

UNITS	SYLLABUS CONTENTS	HOURS
I	மரபுக் கவிதை 1. பெ.சுந்தரனார் - தமிழ்த்தெய்வவணக்கம் 2. இராமலிங்கஅடிகளார் - வள்ளலார் பாடல்கள் 3. பாரதியார் - பாரத ஜனங்களின் தற்கால நிலைமை 4. பாரதிதாசன் - சிறுத்தையே வெளியில் வா 5. மு.நல்லசுவாமிபண்டிதர் - சிலுவைத் தியானமாலை - மரியாள் புலம்பல் 6. கவிமணிதேசிகவிநாயகம்பிள்ளை -புத்தரும் ஏழைச்சிறுவனும் 7. முடியரசன் - மொழிஉணர்ச்சி 8. கண்ணதாசன் - ஆட்டனத்திஆதிமந்தி – ஆதிமந்திபுலம்பல் 9. கல்யாணசுந்தரம் - பட்டுக்கோட்டையார் பாடல் புதுக்கவிதை 1. கவிக்கோஅப்துல் ரகுமான் - வீட்டுக்கொருமரம் வளர்ப்போம் 2. சிற்பி- கவிதைமுடியவில்லை 3. மு.மேத்தா- வாழைமரத்தின் சபதம் 4. வைரமுத்து- புத்தகப்புராணம் 5. ஞானக்கூத்தன் - அம்மாவின் பொய்கள் 6. அறிவுமதி-வள்ளுவம் பத்து 7. நா.முத்துக்குமார் - ஆனந்தயாழை மீட்டுகிறாய் 8. சுகிர்தாராணி- சபிக்கப்பட்டமுத்தம் 9. அபிமானி - தலித்தியக்கவிதைகள் - 10. வைகைச் செல்வி – அம்மி 11. நாட்டுப்புறப்பாடல்	30

II	சிறுகதைகள் 1. புதுமைப்பித்தன் - கடவுளும் கந்தசாமிப் பிள்ளையும் 2. கு.ப.ராஜ கோபாலன் - விடியுமா? 3. கி.ராஜநாராயணன் - கதவு 4. வண்ணதாசன் - ஒருசிறுஇசை 5. உமாமகேஷ்வரி - மரப்பாச்சி உரைநடை 1. இலக்கியத்தின் உயிர்- இரா.மோகன் 2. இருபதாம் நூற்றாண்டுக்கவிதைகளில் தொழிலாளர் நிலை- இரா.மோகன் 3. எண்பதுகளில் புதுக்கவிதைப் போக்குகள் - இரா.மோகன் 4. தமிழ்ச் சிறுகதைகளில் முன்னிலைஉத்தி- இரா.மோகன் 5. வளமுடன் வாழ - அருள்முனைவர் ச.இன்னாசிமுத்து.சே.ச.	15
III	தமிழ் இலக்கியவரலாறு (இக்கால இலக்கியம்)	15
IV	இலக்கணம் - எழுத்து 1. தொல்காப்பியத்தின் எழுத்துவகை 2. முதல் எழுத்துக்கள் 3. சார்பெழுத்துக்கள் 4. மொழிமுதல் எழுத்துக்கள் 5. மொழி இறுதிஎழுத்துக்கள் 6. மொழி இடைஎழுத்துக்கள் 7. போலி 8. பதவிலக்கணம் 9. புணர்ச்சி இலக்கணம்	15
V	பிழையின்றிஎழுதுவோம் 1. பிழைப்பட எழுதும் சொற்களும், திருத்தங்களும் 2. சொற்பொருள் வேறுபாடு 3. பிழையான வாக்கியங்களும், திருத்தங்களும் 4. நிறுத்தற்குறிகள் 5. மரபு 6. வல்லெழுத்து (க்.ச்.த்,ப்) மிகுமிடங்கள் 7. வல்லெழுத்துமிகா இடங்கள் 8. வாக்கியம் :வகைகளும்,மாற்றங்களும் 9. வழ(ழு)க்குத் தமிழ் 10.உவமைகள் - பழமொழிகள் - மரபுத் தொடர்கள்	15
TEXT BOOKS (பாடநூல்கள்)		
- தமிழ்த்துறை வெளியீடு- தூய சவேரியார் கல்லூரி,(தன்னாட்சி)பாளையங்கோட்டை. - வகைமைநோக்கில் தமிழ் இலக்கியவரலாறு- பாக்கியமேரி		
REFERENCE BOOKS (பார்வைநூல்கள்)		
- தமிழ் இலக்கியவரலாறு- சிறிபிபாலசுப்பிரமணியன் - புதியநோக்கில் தமிழ் இலக்கியவரலாறு- தமிழண்ணல் - தமிழ் இலக்கியவரலாறு- சேதுராமன்		
WEB SOURCES(இணையதளங்கள்)		
- Tamil Heritage Foundation – www.tamilheritage.org - Tamil Virtual University Library – www.tamilvu.org/library - Project Madurai – www.projectmadurai.org - Chennai Library – www.chennaiLibrary.com - Tamil University Library – www.ulib.prg - Tamil E-books downloads – tamilebooksdownloads.blogspot.com - Tamil Books online – books.tamilcube.com - Catalogue of the Tamil Books in the library of British congress archive.org		

பொதுத்தமிழ் - II
26UGTL21

Sem	Course Code	Course Category	Hours	Credit	MARK FOR EVALUATION		
					CIA	ESE	TOTAL
II	26UGTL21	GT	6 Hrs	3	100	100	100

COURSE TITLE	பொதுத்தமிழ் - II
---------------------	-------------------------

COURSE OUTCOMES (பயன்கள்)

CO1	பக்தி இலக்கியத்தின்தோற்றம்,வளர்ச்சி சிற்றிலக்கியத்தின் தோற்றம்,வளர்ச்சி குறித்து அறிந்துகொள்வர்.(K1)
CO2	பக்தி இலக்கியங்கள் ,சிற்றிலக்கியங்கள் முதலியவற்றின் இலக்கண மற்றும் இலக்கிய அமைப்பை விளங்கிக் கொள்வர் (K2)
CO3	பக்தி இலக்கியப் பாடல்களில் காணப்படும் தெய்வவழி பாட்டுணர்வு, சிற்றிலக்கியங்களில் காணலாகும் சமூகநீதிக் கருத்துகளை, இன்றைய வாழ்வோடு தொடர்புபடுத்தி நோக்குவர் (K3)
CO4	பக்தி இலக்கியம் சிற்றிலக்கியங்களின் வழி இலக்கண இலக்கியச்சிறப்புகளை ஒப்பிட்டுப் பேதங்களைக் காண்பர். (K3)
CO5	பக்தி இலக்கிய, சிற்றிலக்கியங்களின் வழி தமிழ்மொழி, பண்பாடு, மதம், தத்துவம் ஆகியவற்றினை மதிப்பிட்டுச் சீர்தூக்கிப் பார்ப்பர் (K5)
CO6	கற்ற இலக்கியங்களை அடிப்படையாகக் கொண்டு,சிறுபக்திக் கவிதைகள் அல்லது சிற்றிலக்கிய மரபில் பாடல் இயற்றும் திறன் பெறுவர்.,(K6)

UNITS	SYLLABUS CONTENTS	HOURS
I	பக்தி இலக்கியம் -1 1. திருஞானசம்பந்தர் - திருக்கோடிக்கா 2. திருநாவுக்கரசர் - திருப்பாதிரிப்புலியூர் 3. திருப்பாவை - ஆண்டாள் 4. குலசேகரஆழ்வார் - 5 ஆம் பதிகம் 5. சித்தர் பாடல்கள் - அழகணிசித்தர் (தேர்ந்தெடுக்கப்பட்டபாடல்கள்) சிற்றிலக்கியம்: 2 1 கலிங்கத்துப்பரணி - களம் பாடியது 2. திருக்குற்றாலக் குறவஞ்சி - மலைவளம் 3. திருக்காவலுர்க்கலம்பகம் - சமூகஉல்லாசம் 4. முக்கூடற்பள்ளு-நாட்டு வளம் 5. தமிழ்விடுதாது - தூதுக்கானகாரணம்	30
II	ஊரைநடை 1. இறைநம்பிக்கையும் மனிதவாழ்வும் 2. இயேசுபிரான் குறிப்பிடும் எண்வகைமனிதர்கள் 3. நபிகள் நாயகத்தின் வாழ்வியல் நெறிகள் 4. திருமூலர் காட்டும் இறைநெறி 5. வள்ளலார் கூறும் வாழ்வியல் நாவல் - கருப்பாயி என்கிற நூர்ஜஹான் -அன்வர் பாலசிங்கம்	15
III	தமிழ் இலக்கியவரலாறு (பக்திஇலக்கியம்,சிற்றிலக்கியம் தொடர்பானபகுதிகள்)	15
IV	இலக்கணம் சொல்லின் இலக்கணம்-பெயர் ,வினை, இடை,உரிச்சொற்கள்	15

	பிறமொழிச் சொற்களைத் தமிழில் வழங்கும் முறை	
V	மொழிபெயர்ப்பு ஆட்சிச் சொல்லகராதி - மரபுத் தொடர்கள் -பழமொழிகள் - திருக்குறள்	15
TEXT BOOKS (பாடநூல்கள்)		
1. தமிழ்த்துறைவெளியீடு - தூயசவேரியார் தன்னாட்சிக் கல்லூரி,பாளையங்கோட்டை. 2. வகைமைநோக்கில் தமிழ் இலக்கியவரலாறு - முனைவர்பாக்கியமேரி 3. கருப்பாயின்கிறநூர்ஜஹான் -அன்வர் பாலசிங்கம்		
REFERENCE BOOKS (பார்வைநூல்கள்)		
• தமிழ் இலக்கியவரலாறு - சிற்பி. பாலசுப்பிரமணியன் • புதியநோக்கில் தமிழ் இலக்கியவரலாறு - தமிழண்ணல் • தமிழ் இலக்கியவரலாறு- சேதுராமன்		
WEB SOURCES (இணையதளங்கள்)		
• Tamil Heritage Foundation- www.tamilheritage.org • Tamil virtual University Library- www.tamilvu.org/ library http://www.virtualvu.org/library • Project Madurai - www.projectmadurai.org. • Chennai Library- www.chennailibrary.com . • Tamil Universal Digital Library- www.ulib.prg . • Tamil E-Books Downloads- tamilebooksdownloads. blogspot.com		

பொதுத்தமிழ் - III

26UGTL31

Sem	Course Code	Course Category	Hours	Credit	MARK FOR EVALUATION		
					CIA	ESE	TOTAL
III	26UGTL31	GT	6 Hrs	3	100	100	100
COURSE TITLE		பொதுத்தமிழ் - III					

COURSE OUTCOMES (பயன்கள்)

CO1	மாணவர்கள் காப்பியம், உரைநடை, ஊடகத்தமிழ், இலக்கணம், யாப்பு ஆகியவற்றின் அடிப்படைக் கருத்துக்கள்,பண்புகள், வரலாற்றுப் பின்னணிகளை அறிதல். (K1)
CO2	மாணவர்கள் தமிழ் இலக்கியவடிவங்கள் (காப்பியம்,உரைநடை) மற்றும் இலக்கணக் கூறுகளைப் (எழுத்து,சொல்,பொருள்,யாப்பு) புரிந்துகொண்டு அவற்றின் தனித்துவங்களைவிளக்கிக் கொள்ளல். (K2)
CO3	மாணவர்கள் கற்ற இலக்கணவிதிகள் மற்றும் யாப்புமுறைகளைப் பயன்படுத்தி சரியான தமிழ் வாக்கியங்களையும் செய்யுள்களையும் உருவாக்கப் பயிற்சியளித்தல். (K3)
CO4	மாணவர்கள் காப்பியங்கள் மற்றும் உரைநடைப் படைப்புகளைப் பகுத்து, ஆய்வுசெய்து,அதன் கருத்து,கட்டமைப்பு, இலக்கியநயம் ஆகியவற்றை ஆராய்தல். (K4)
CO5	மாணவர்கள் இலக்கியப் படைப்புகளைதரம்,மொழிநடை, இலக்கணஅமைப்பு ஆகியவற்றைவிமர்சனமுறையில் மதிப்பீடுதல், (K5)
CO6	மாணவர்கள் தமிழ் இலக்கணம் மற்றும் யாப்புஅடிப்படையில் சுயமாக செய்யுள்,கட்டுரை,உரைநடைப் படைப்புகளைஉருவாக்கப் பயிற்சியளித்தல்;(K6)

UNITS	SYLLABUS CONTENTS	HOURS
I	1. சிலப்பதிகாரம் - வழக்குரைக் காதை. 2. மணிமேகலை- ஆபுத்திரன் திறம் அறிவித்தகாதை. 3. சீவகசிந்தாமணி- பதுமையர் இலம்பகம். 4. கம்பராமாயணம் - மந்தரைச் சூழ்ச்சிப் படலம். 1. சூளாமணி 2. உதயணகுமாரகாவியம் 3. இயேசுகாவியம் 4. மருமக்கள் வழி மான்மியம்	30
II	ஊரைநடை 1. காளத்திவேடனும் கங்கைவேடனும். 2. தீமையை இயற்றும் தன்மையினர் கூனி இயாகோ. 3. சிலம்புகாட்டும் சீர்மிகு சிந்தனைகள். 4. மணிமேகலை காப்பியத்தில் மானுட விழுமியங்கள். நாடகம் - வேலைக்காரி - அறிஞர் அண்ணா.	15
III	தமிழ் இலக்கிய வரலாறு (காப்பியங்கள்)	15
IV	இலக்கணம் - யாப்பு,எழுத்து, அசை. சீர்,தளை, அடி,தொடை,பா வகைகள்	15
V	ஊடகத்தமிழ் - விளக்கம், வகைகள்,செயல்பாடுகள் 1.இதழ்கள்	15

	2.வானொலி 3.தொலைக்காட்சி 4.திரைப்படம்	
TEXT BOOKS (பாடநூல்கள்)		
- தமிழ்த்துறைவெளியீடு-தூயசவேரியார்க் கல்லூரி,(தன்னாட்சி) பாளையங்கோட்டை. - வகைமைநோக்கில் தமிழ் இலக்கியவரலாறு-பாக்கியமேரி		
REFERENCE BOOKS (பார்வைநூல்கள்)		
- தமிழ் இலக்கியவரலாறு-சிற்பிபாலசுப்பிரமணியன் - புதியநோக்கில் தமிழ் இலக்கியவரலாறு-தமிழண்ணல் - தமிழ் இலக்கியவரலாறு-சேதுராமன்		
WEB SOURCES (இணையதளங்கள்)		
- Tamil Heritage Foundation – www.tamilheritage.org<http://www.tamilheritage.org> - Tamil Virtual University Library – www.tamilvu.org/library http://www.virtualvu.org/library - Project Madurai – www.projectmadurai.org - Chennai Library – www.chennailibrary.com<http://www.chennailibrary.com - Tamil University Library – www.ulib.prg<http://www.ulib.prg> - Tamil E-books downloads – tamilbooksdownloads.blogspot.com - Tamil Books online – books.tamilcube.com - Catalogue of the Tamil Books in the library of British congress archive.org		

பொதுத்தமிழ் - IV
26UGTL41

Sem	Course Code	Course Category	Hours	Credit	MARK FOR EVALUATION		
					CIA	ESE	TOTAL
IV	26UGTL41	GT-IV	6 Hrs	3	100	100	100
COURSE TITLE		பொதுத்தமிழ்- IV					
COURSE OUTCOMES (பயன்கள்)							
CO1:	பழந்தமிழ் இலக்கியவரலாற்றறிவைப் பெறுதல் (K1, K2)						
CO2:	சங்க இலக்கிய அறிமுகங்களின் ஊடாகத் தமிழர் வாழ்வியல் நெறிகளை உணர்தல். (K2,K3)						
CO3:	தமிழ் இலக்கியங்களின் செய்யுள் உருவம்,உள்ளடக்கம், படைப்பியல் கொள்கைகளைப் புரிந்துகொள்ளுதல். (K4)						
CO4:	அகத்திணை,புறத்திணைவாழ்வியல் நெறிப்பாடுகளின் ஊடாகத் தமிழர்ப்பண்பாட்டு அடிப்படைகளை மதிப்பிடும் திறன் பெறுதல். (K2,K3)						
CO5:	மொழித்திறன்,படைப்புத்திறன் பெறுதல். (K3,K4)						
CO6:	நாடக இலக்கியஅனுபவத்தின் வழியாகதமிழ்ச் சமூகநிலைகளை இலக்கியமாக்கும் நுட்பங்களைப் பெறுதல். (K2,K6)						

UNITS	SYLLABUS CONTENTS	HOURS
I	செய்யுள் பகுதி 1 1. நற்றிணை (5பாடல்கள்) 2. குறுந்தொகை (5பாடல்கள்) 3. அகநானூறு (2பாடல்கள்) 4. புறநானூறு (5பாடல்கள்)	30
	செய்யுள் பகுதி 2 1. நெடுநல்வாடை முழுமையும் 2. திருக்குறள் (விருந்தோம்பல், நட்பாராய்தல், குறிப்பறிதல்) 3. நாலடியார் (கல்வி)	
II	உரைநடைக் கட்டுரைகள் 1. ஊரும் பேரும் - ரா.பி. சேதுபிள்ளை 2. தமிழர் பண்பாடும்அதன் சிறப்பியல்புகளும் - தனிநாயகம் அடிகளார் 3. இலக்கியஉருவாக்கமும் பயனும் - சேதுமணிமணியன் பயண இலக்கியம் 1. மண் புதிது - சுப்ரபாரதிமணியன்	15
III	தமிழ் இலக்கியவரலாறு 1. சங்ககாலம் 2. சங்கம் மருவியகாலம்	15
IV	இலக்கணம் -பொருள் 1. அகப்பொருள் 2. புறப்பொருள் 3. அணியிலக்கணம் (உவமை,உருவகம்,பிறிதுமொழிதல்,வஞ்சப்புகழ்ச்சி,தற்குறிப்பேற்ற அணி)	15
V	மொழிப்பயிற்சி 1. ஒப்பும் மறுப்பும் (ஒருகருத்தினை வெட்டி,ஒட்டி எழுதும் பயிற்சி) 2. விண்ணப்பம் எழுதுதல் (பயிற்சி) 3. தமிழில் தன்விவரக் குறிப்புவரைதல் (பயிற்சி) 4. மேடைப்பேச்சு நுட்பங்கள் (நேர்முகப் பயிற்சிமற்றும் மதிப்பீடு)	15

TEXT BOOKS (பாடநூல்கள்)	
1. பொதுத்தமிழ் பாடநூல், தமிழ்த்துறை வெளியீடு ,தூய சுவேரியார் கல்லூரி,பாளையங்கோட்டை.	
2. பாக்கியமேரி,தமிழ் இலக்கியவரலாறு,பதினொன்றாம் பதிப்பு - 2025 ,பூவேந்தன் பதிப்பகம்,மயிலாப்பூர்,சென்னை.	
3. சுப்பாரதிமணியன்இமண் புதிது,முதல் பதிப்பு 2018 அறிவுப்பதிப்பகம்,சென்னை.	
REFERENCE BOOKS (பார்வைநூல்கள்)	
பார்வை நூல்கள்	
1. மது.ச.விமலானந்தம்தமிழ் இலக்கியவரலாறு,	
2. மு. வரதராசனார்,தமிழ் இலக்கியவரலாறு,	
3. தமிழண்ணல்,புதியநோக்கில் தமிழ் இலக்கியவரலாறு.	
WEB SOURCES (இணையதளங்கள்)	
• Tamil Heritage Foundation – www.tamilheritage.org<http://www.tamilheritage.org> • Tamil Virtual University Library – www.tamilvu.org/library http://www.virtualvu.org/library • Project Madurai – www.projectmadurai.org • Chennai Library – www.chennailibrary.com<http://www.chennailibrary.com> • Tamil University Library – www.ulib.prg<http://www.ulib.prg> • Tamil E-books downloads – tamilebooksdownloads.blogspot.com • Tamil Books online – books.tamilcube.com • Catalogue of the Tamil Books in the library of British congress archive.org	

HINDI

SEMESTER 1

UNIT I: GRAMMAR

- Swar(स्वर),
- Vyanjan(व्यंजन),
- Barah Khadi(बारहखड़ी),
- Shabd aur Vakya Rachna (शब्द और वाक्य रचना)

UNIT II: SUBODH HINDI RACHNA

- Binna binna arth(भिन्न भिन्न अर्थ),
- Numbers (गिनती1-100),
- Vaakyong mein Prayag kijiye (वाक्यों में प्रयोग कीजिये)
- Rishto ke Naam (रिश्तो के नाम)
- Gharelu padartho ke Naam (घरेलु पदार्थों के नाम)

UNIT III: PROSE

- Sadharan Vakya aur Sangya (संज्ञा),
- Sarvanaam(सर्वनाम)
- Visheshan(विशेषण)
- Kriya (क्रिया)

UNIT IV: SHORT STORIES

- Bacho ki Kahaniya

UNIT V: COMPREHENSION

- Sant Tiruvalluvar, संत तिरुवल्लुवर,
- Hamara desh, (हमारा देश,)
- Paryavaran Sanrakshan, (पर्यावरण संरक्षण)
- Naari Sashaktikaran, (नारी सशक्तिकरण)
- Rastriya janvar(राष्ट्रीय जानवर)

Reference Books

Hindi sentences - Chaturbhuj Sahay

Subodh Hindi Grammar - Phoolchand Jain

Sankshipt Hindi Grammar - Kamta Prasad

Practical Hindi - Nagappa

Abhinav Hindi Grammar – Nagappa

Saral Hindi Grammar - Shyamchandra Kapur

Grammar Pradeep - Ramdev

Laghu Bal Kathaye - Ramashankar

Captivating Stories - Premchand

CONCISE GRAMMAR OF THE HINDI LANGUAGE - H.C Scholberg

Hindi Grammar - Edwin Greaves

SEMESTER II

UNIT I: Hindi Ekankiya

- Sooryodhaya(सूर्योदय),
- Mayoppiya (मायोपिया),
- Udhayan (उदयन),
- Upendranath Ashk – Lakshmi ka Swagat

Characters: (Tippani)

- Nirjarani (निर्झरणी),
- Sudhi(सुधी)
- Thathagath(तथागत),
- Udhayan (उदयन),

UNIT II: Hindi Kahaniya

- Premchand – Bade Ghar ki Beti
- Malathi Joshi – Vo Tera Ghar Yah Mera Ghar
- Gyanranjan - Pita

UNIT III: ANCIENT POETRY

- Pathya Chayanika– KabeerDhoha–Saaki (साखी) 1 to 10.

UNIT IV: Vyakaran

- Kriya Visheshan (क्रियाविशेषण),
- Sambandh Bodhak (संबंधबोधक),
- Samuchay Bodhak (समुच्चयबोधक)
- Vismayadi Bodhak (विस्मयादिबोधक) aadi shabdo ka prayog

UNIT V:

Pratiyogi Pariksha par aadharit Nimnalikhit Vishayo se sambandhit Prashikshan Karya

- Tamil Bhasha: Mahakavi Bharatiyar
- Sanket Vikas dwara Lekhan kala aur Kahani Lekhan ka Vikas
- Gadyansh dekhkar sahi Shirshak chunna
- Pathit Vyakaran par aadharit Vakya rachna
- Vibhinna Pratiyogi parikshao ke bare mein suchna pradan dena

Reference Books

- Sooryodaya (Dakshin Bharat Hindi Pracharsabha publications)
- Aath Ekanki Natak - Ed. Dr. Ramkumar Verma
- Das Ekanki

SEMESTER III

Niji Patra – Arth aur Bhed, Pitaji/Mataji ke naam patra, Mitra, Bhai aadi ke naam patra

UNIT I: Niji Patra Lekhan

- Niji Patra - Arth aur Bhed
- Pitaji/Mataji ke naam patra
- Mitra, Bhai aadi ke naam patra
- Paribhashik Shabdawali - 20 words

Unit II

- Samajik Patra Lekhan
- Aavedan Patra - Noukri, Chutti aadi
- Dak Adhikari ke naam patra
- Paribhashik shabdawali - 20 words

Unit III

- Vyavasayik Patra Lekhan
- Vyavasayik Patra - Arth aur Bhed
- Prakashak ke naam patra
- Shikayathi
- Paribhashik shabdawali - 20 words

Unit IV

- Samanya Parichay
- Sarkari Patra
- Ardh-Sarkari Patra
- Gyapan, Paripatra
- Anusmarak
- Paribhashik Shabdawali - 20 words

Unit V

- Precis Writing And Applied Grammar (Ling, Vachan and Karak)
- Karak (कारक)
- Vachan badaliye(वचन बदलिए),
- Ling badaliye(लिंग बदलिए)

Reference Books

- Viyavaharik Hindi, Hindi Prachar press, T.Nagar, Madras-600 017
- Alekhan aur Tippan - Prof. Viraj
- Alekhan Kichlu

SEMESTER IV

UNIT I: STORIES (दक्षिणी कथाएं)

- Meri pathni(मेरी पत्नी),
- Thotha aur Mynah(तोता और मैना),
- Noorunisha(नूरनिशा),
- Mruthudhand (मृत्यु दंड),
- Karmaveer(कर्मवीर) and their Characters.

UNIT II: Proud yogiki aur Hindi

- Unicode
- Dewanagari Lipi
- Hindi ki Vibhinna Website - Ek Parichay

UNIT III: POETRY (काव्यशास्त्र)

Ras :

- Kavyaras (काव्यरस),
- Veer ras (वीररस),

Sandh:

- Chowpayi (चौपाई),
- Rola(रोला),

Alankar:

- Yamakalankar (यमकअलंकार),
- Upmaalankar (उपमाअलंकार).

UNIT IV:

AUTOBIOGRAPHY (Sathya ka Swar–Gandhiji ki Jeevani)

- Ma, bap aur Janma(मां, बाप और जन्म)
- Ladakpan (लड़कपन)
- High school mein (हाई स्कूल में)
- Vivah aur Mamsabhakshan(विवाह और मांस भक्षण)
- Ankhen Kuli (आंखें खुली)

Unit V :Pratiyogi priksha par aadharit Computer sambandhit prashikshan Karya

- Hindi mein Powerpoint banana
- Hindi mein Google Document taiyar karna
- Hindi mein Google form taiyar karna
- Vibhinna pratiyogi parikshao ke bare mein suchna pradan karna

Reference Books

- Social Networking: Naye Samay ka Samvad – Ed. Sanjay Dwivedi
- Jansanchar aur Maas Culture - Jagdeeshwar
- Media: Bhumandalikaran aur Samaj - Ed. Sanjay Dwivedi
- Naye Jamane ki Patrakarita - Sourabh Shukla
- Patrakarita se Media tak - Manoj Kumar

French semester-I

UNIT. I

Communication:	Decrire la salle de classe et le professeur.
Grammaire :	Les articles indefinis et defines, les verbes reguliers et irreguliers.
Culture:	Les symbols de la France.
Projet:	Desiner les objets dans le sac et dans la trousse.

UNIT. II

Communication:	Parler de la journee.
Grammaire :	Les verbes pronominux,Affirmatif Negatif et interrogatif
Culture:	Les Frontieres de la France.
Projet:	Faire un rapport sur la journee des parents.

UNIT. III

Communication:	se presenter, parler de la nationlite, dire son numero de telephone.
Grammaire :	Les prepositions , Accord adjective nom, verbes aller venir.
Culture:	Les fete en France trditions et multi culturralisme.
Projet:	faire une liste des camarades et noter leurs numeros de telephone a haute voix et demander a un ami de verifier.

UNIT. IV

Communication:	parler de la nourriture et des repas simples et sains.Decrire les repas.
Grammaire :	L'impertif, Les articles partitifs,
Culture:	Les plats francais.
Projet:	Dessiner et decrire l nourriture que les gens mangent dans leur pays,

UNIT. V

Communication:	Exprimer ses gouts.
Grammaire :	Les adjectifs qulificatifs, les adjectifs possessifs, La negation.
Culture:	La France et ses regions.
Projet:	qu'est-ce que tu aimes faire pendant ton temps libre?

- Lecon 1.** La vie scolaire de luc
- Lecon 2.** La vie quotidienne de luc
- Lecon 3.** Le monde multiculturel
- Lecon 4.** La bonne nourriture
- Lecon 5.** Parlons de nos preferences

Ref.Avenir method de francais 3

French
Semester-II

UNIT. I

Communication:	Demander et donner les directions , Situer un endroit (sur la carte)
Grammaire :	Les prepositions L'interrogation.
Culture:	Les vetements francais.
Projet:	Faire une carte de la ville imaginaire.

UNIT. II

Communication:	Parler de la semaine ,Parler des activites faites pendant la semaine.
Grammaire :	Les articles contractes,Les adjectifs demonstratifs, les expressions avec les verbes Faire et Avoir.
Culture:	Les villes connues en France.
Projet:	Preparer un emploi du temps avec des activites faites pendant la semaine.

UNIT. III

Communication:	Parler du passe, Raconter le week end dernier.
Grammaire :	Le passe compose avec l'auxiliaire avoir, La formation du participe passe.
Culture:	Noel
Projet:	Faire un petit dossier sur les activites faites pendant les vacances d'ete.coller les photos de ces activites faites.

UNIT. IV

Communication:	Parler du passe, Rconter les vacances dernieres
Grammaire :	Le passe compose avec l'auxiliaire etre.
Culture:	Les montagnes en France.
Projet:	Preparer un dossier sur la fete favorite celebree l'annee derniere.

UNIT. V

Communication:	Parler de la ville de demain , Exprimer des projets et des predictions.
Grammaire :	Le future proche, Le future simple.
Culture:	Les monuments en France.
Projet:	Imaginer et presenter la ville du future

Lecon 6. Sara cherche son chemin

Lecon 7. Ma semaine en action

Lecon 8. Mon weekend dernier

Lecon 9. Mon sejour a Annecy

Lecon 10. La ville du futur

Ref.Avenir method de francais 3

French
semester-III

UNIT. I

- Communication:** Decrier ce que les Francais aiment faire , Parler de la vie des Francais.
- Grammaire :** Les articles indefinis et defins ,Les articles partitifs,Les articles contractes.
- Culture:** La France dans le Coeur des Francais.
- Projet:** Preparer un dossier sur ce que les gens du pays aiment faire.

UNIT. II

- Communication:** Comparer la vie des adolescents d'autrefois et d'aujourd'hui.
- Grammaire :** Le negation,Les articles.
- Culture:** Les sous cultures adolescents.
- Projet:** Decrivez la vie des adolescents d'hier et d'aujourd'hui.

UNIT. III

- Communication:** Parler d'un sport.
- Grammaire :** L'imperatif,L'interrogation questions/reponses,Lesconjonctins.
- Culture:** Le sport en France.
- Projet:** Parler du sport favort.

UNIT. IV

- Communication:** Decriver les vacances,Racontredes experiences,Envoyerles mails.
- Grammaire :** Le passe compose.
- Culture:** La France ,une destination touristique.
- Projet:** Dessiner ou coller les images de l'anniversaire fete l'annee derniere, rediger un petit texte pour raconter ce jour.

UNIT. V

- Communication:** Parler d'une sortie scolaire,Ecrire un e-mail.
- Grammaire :** Le passe recent, le futur proche .
- Culture:** Les penitures celebres du muse du Louvre.
- Projet:** Ecris sur une visite au muse.

- Lecon 1.** Esprit Francais.
- Lecon 2.** Les ados modernes
- Lecon 3.** Une grande aventure a velo
- Lecon 4.** Un sejour a nice
- Lecon 5.** La sortie au muse scientifique

Ref.Avenir method de francais 4

French Semester-IV

UNIT. I

Communication:	Parler de l'automobile
Grammaire :	Les adjectifs les verbes .
Culture:	Les automobiles en France.
Projet:	Faire un dossier sur ta voiture .Coller une photo de cette voiture et decire cette voiture.

UNIT. II

Communication	Reflechir aux villes a venir,Parler des projets d'avenir.
Grammaire :	Le futur simple ,le futur proche.
Culture:	Les projets d'avenir en France
Projet:	preparer un dossier sur les changements attendus dans la ville

UNIT. III

Communication:	partager la recette , Parler de la nourriture.
Grammaire :	Les adverbs de quantite,l'adjectif indefini.
Cultur	les fetes et les traditions.
Projet:	Preparerun dossier sur un dessert prefereet parle de son origine.

UNIT. IV

Communication:	Discuter les avantages d'internet,Ecrire un blog.
Grammaire :	Les adjectifs demonstratifs , Les adjectifs possessifs ,Les prepositions.
Culture:	Les principaux medias francais.
Projet:	Faire un rapport sur les avantages et les inconvenients d'internet.

UNIT. V

Communication:	Rediger des invitations , Ecrire des .messages les consignes, Repondre a une invitation.
Grammaire :	Les verbes pronominaux , les verbes pronominaux a l'impertif.
Culture:	Les arts du spectacle en France.
Projet:	Rediger une belle invitation pour feter l'anniversaire d'un grand parent.

Lecon 6. Le monde des automobiles

Lecon 7. La vie en 2050

Lecon 8. L'epiphanie en France

Lecon 9. La vie en ligne

Lecon 10. On fait quoi ce week-end?

Ref.Avenir method de francais 4

GENERAL ENGLISH

DEPARTMENT OF ENGLISH

UG – PART II - GENERAL ENGLISH

(The Seven-Tier Pattern recommended by UGC Curriculum Development Centre and Identified as Best Practice by NAAC)

	Stream A (For learners of high entry level proficiency)	Stream B (For learners of average entry level proficiency)	Stream C (For learners of low entry level proficiency)
Courses in Semester I	IV 26UGEL14	III 26UGEL13	I 26UGEL11
Courses in Semester II	V 26UGEL25	IV 26UGEL24	II 26UGEL22
Courses in Semester III	VI 26UGEL36	V 26UGEL35	III 26UGEL33
Courses in Semester IV	VII 26UGEL47	VI 26UGEL46	IV 26UGEL44

GENERAL COURSE OUTCOMES

CO1 Acquire the four language skills (Listening, Speaking, Reading, and Writing)

CO2 Develop the skill of independent reading and interpreting of graded texts

CO3 Expand and consolidate active and passive vocabulary

CO4 Acquire the skills needed to participate in a conversation that builds knowledge collaboratively

CO5 Acquire a clear understanding of English Grammar to facilitate the accuracy of communication.

CO6 Develop the skills of formal written communication to be used in academic and career-related contexts

TEXTS

Course I – *SPARK I: An Integrated Course Text for General English*, Department of English, St. Xavier's College (Autonomous), Palayamkottai.

Course II - *SPARK II: An Integrated Course Text for General English*, Department of English, St. Xavier's College (Autonomous), Palayamkottai.

Course III - *SPARK III: An Integrated Course Text for General English*, Department of English, St. Xavier's College (Autonomous), Palayamkottai.

Course IV - *SPARK IV: An Integrated Course Text for General English*, Department of English, St. Xavier's College (Autonomous), Palayamkottai.

Course V - *SPARK V: An Integrated Course Text for General English*, Department of English, St. Xavier's College (Autonomous), Palayamkottai.

Course VI – *SPARK VI: An Integrated Course Text for General English*, Department of English, St. Xavier's College (Autonomous), Palayamkottai.

Course VII - *SPARK VII: An Integrated Course Text for General English*, Department of English, St. Xavier's College (Autonomous), Palayamkottai.

EXTERNAL EXAMINATION

❖ External Examination has two components:

1) Written Examination and 2) Spoken English Viva Voce

❖ A three-hour written examination will be conducted for 100 marks for all General English papers and the scores will be converted to 40 marks, with a pass minimum of 16 marks.

❖ At the end of every semester, Spoken English Viva Voce will be conducted for all the students for 100 marks (four components) and the scores will be converted to 10 marks, with a required pass minimum of 4 marks.

❖ To pass in any General English paper, a student must secure the pass minimum of 40 out of 100 (16/40 in Written Examination and 4/10 in Spoken English Viva Voce Examination).

Distribution of marks: **Written Exam** (100 marks) Converted to 40 marks
 Spoken English Viva voce (100 marks) Converted to 10 marks
 TOTAL (40+10) = 50 marks

INTERNAL ASSESSMENT

❖ Two Internal Examinations shall be conducted for 50 marks each along with the Continuous Internal Assessments for 30 marks.

❖ The internal assessment for the courses may include skill-based activities such as seminar presentation/spoken English /critical podcast/ video essay/ creating a 5–8 slides on a topic/ composing a poem/ submitting a relevant photo with description etc.

In both the Internal Examinations and Semester Written Examination, 40% of the mark is allotted for literature-based questions, and 60% of the mark is allotted for grammar and composition exercises.

General English Evaluation Procedure

Internal Examination			Converted to	Total
CIA 1 (Written)	50	Converted to 70	50	100
CIA 2 (Written)	50			
Two Classroom Assessments (Spoken/Skill-based Activities) 2x 15	30	30		
External Examination			Converted to	
Semester Exam (Written)	100	Converted to 40/ (Pass Min. 16)	50	
Semester Viva Voce 4x25 (Spoken)	100	Converted to 10/ (Pass Min. 4)		

Course I

Hours: 6

Course Code: 26UGEL11

Credits: 3

LEARNING OUTCOMES

LO1 To provide an ambience to acquire the basic language skills, listening, speaking, reading, and writing

LO2 To make the learners learn the basic elements of grammar

LO3 To enable them to involve in basic communicative activities

LO4 To develop basic vocabulary

LO5 To help the learners comprehend and respond in English

LO6 To build confidence in using English to communicate

UNIT – I POETRY (READING AND WRITING SKILLS)

1. Sarojini Naidu- “Indian Weavers”
2. Robert Burns – “My Love is like a Red Red Rose”

UNIT – II SHORT STORIES (READING AND WRITING SKILLS)

1. W. Somerset Maugham – “The Ant and the Grasshopper”
2. Guy De Maupassant – “The Necklace”

UNIT –III GRAMMAR AND VOCABULARY SKILLS

1. Use of Verbs: Verb Grid (Positive, Negative & Question), Regular Verbs, Irregular Verbs & Modal
2. Tenses: Active Voice Tenses & Passive Voice Tenses
3. Use of Nouns: Forms of Personal Pronouns, Use of Nouns as Subject, Object, Complement and Object of the Preposition
4. Sentence Patterns: SV, SVO, SVC, SVA, SVOA, SVIODO
5. Punctuation and Capitalisation
6. Reading Comprehension (5 Anecdotes and 5 Wisdom Stories)

UNIT – IV LISTENING AND SPEAKING SKILLS

1. Listening Practice –Listen and Do exercises: Listening to English songs, simple Indian short stories, homonyms/homophones
2. Pronunciation Practice: Vegetables, Fruits, Flowers, Trees, Spices, Eatables
3. Introducing Oneself
4. Introducing Others

UNIT –V LISTENING AND SPEAKING SKILLS

1. Greetings
2. Making Request
3. Reading Aloud (From the text)
4. Describing a place / a picture (With hints)

COURSE OUTCOMES

Learners will be able to

CO1 Use grammatical structures in meaningful constructions

- CO2** Use oral communication for day-to-day activities
CO3 Use simple sentences for oral and written communication
CO4 Use punctuation and capitalisation accurately
CO5 Comprehend what they listen to, and respond to it at the primary level
CO6 Read and appreciate simple stories and anecdotes

TEXT BOOKS

- *SPARK I: An Integrated Course Text for General English*, Department of English, St. Xavier's College (Autonomous), Palayamkottai.
- *Intermediate English Grammar* by Raymond Murphy. Cambridge University Press, 2019.

REFERENCE

- *Spoken English: A Foundation Course* by Kamalesh Sadanand and Susheela Punitha, Orient Longman Private Limited, 2008, ISBN 81-250-3467-6.
- *Spoken English for You* by G. Radhakrishna Pillai and K. Rajeevan, Emerald Publishers, 1987, ISBN 978-81-7966-023-2.
- *Better English Pronunciation* by Thakur KBP Sinha, Vijay Nicole Imprints, 2005, ISBN 81-8209-068-7.
- Bhatnagar, R. P. *English for Competitive Examinations*, India: Trinity Press, 2017
- Sinha, R. P. *Current English Grammar and Usage with Composition*. India: Oxford University Press, 2018.

QUESTION PATTERN

SEMESTER EXAMINATION

Marks

PART A - MCQs (7 from each of the Units I, II & 6 from Unit III) 20

PART B - Compulsory - Units I, II & III (5X3) 15

- Unit I - Short answer/ ERC
- Unit II - Short answer/ ERC
- Verb Grid (be verb)
- Verb Grid (possessive)
- Verb Grid (action/passive)

PART C – Compulsory- Unit III (5x7) 35

- Use of Verbs: Verb Grid
- Tenses
- Use of Nouns
- Sentence Patterns
- Punctuation and Capitalisation

PART D - (3x10) 30

- Essay (250 words) Unit I (Either/or)
- Essay (250 words) Unit II (Either/or)
- Compulsory -Comprehension

TOTAL

100

INTERNAL EXAMINATIONS		Marks
PART A - MCQs 6X1(2 from each of the Units I, II & III)		6
PART B- Compulsory - one question from each of the Units I, II & III		
1 Short answer/ 1 ERC / Grammar (3X3)		9
PART C –Compulsory (Unit III) (3X5)		15
PART D- (2X10)		20
• Essay - Either /or Units – I & II 250 words • Compulsory- Grammar/ Composition		
TOTAL		50

INTERNAL ASSESSMENTS Marks

Skill-based activity - 2x15 30
 (Seminar presentation/Spoken English/Critical Podcast/ Video Essay/ Creating a 5–8 slide on a topic/
 Composing a poem/ Submitting a relevant photo with description, etc.)
TOTAL 30

Viva Voce Components: 100 Marks

1. Introducing Oneself / Others (25)
2. Reading Aloud (From the text) (25)
3. Describing a place / a picture (With hints) (25)
4. Conversation with the examiner (Greetings/ Making Request) (25)

COURSE II

Hours: 6

Course Code: 26UGEL22

Credits: 3

LEARNING OUTCOMES

LO1 To provide an ambience to acquire the basic language skills, listening, speaking, reading, and writing

LO2 To make the learners frame questions and answers

LO3 To enable them to involve in basic communicative activities

LO4 To develop a comprehensible use of adjectives

LO5 To help the learners comprehend and respond in English

LO6 To develop oral communication for day-to-day activities

UNIT – I POETRY (READING AND WRITING SKILLS)

1. Rabindranath Tagore – “Leave this Chanting and Singing”
2. Gerard Manley Hopkins- “God’s Grandeur”

UNIT – II SHORT STORIES (READING AND WRITING SKILLS)

1. Sister Nivedita - “The Judgement Seat of Vikramaditya”
2. Stephen Leacock - “With the Photographer”

UNIT – III GRAMMAR AND VOCABULARY SKILLS

1. Use of Adjectives
2. Use of Conditional ‘If’ (Probable & Improbable Conditions)
3. Use of ‘who’, ‘which’, ‘where’ & ‘that’ in combining sentences
4. Framing questions – ‘Wh –’ & ‘Yes’ / ‘No’ Questions
5. Prefixes and Suffixes
6. Developing Hints into a Paragraph

UNIT – IV LISTENING AND SPEAKING SKILLS

1. Listening Practice – Listen and Do exercises: Sound patterns and words ending ‘s’ endings and ‘d’ endings, and Listening to English songs and Indian short stories
2. Pronunciation Practice: Medical Terms/ Names of Ailments/People /Currency/ Countries and Capitals/World-famous Cities
3. Making Requests
4. Offering help

UNIT – V LISTENING AND SPEAKING SKILLS

1. Seeking Permission
2. Expressing Gratitude
3. Reading Aloud (from the Prescribed Text)
4. Narrating a Story (from Hints)

COURSE OUTCOMES

Learners will be able to

CO1 Use grammatical structures in meaningful contexts

CO2 Use oral communication for day-to-day activities

CO3 Use simple sentences for oral and written communication

CO4 Use enhanced vocabulary

CO5 Comprehend and respond to what they listen to at the secondary level
CO6 Read and appreciate simple pieces of fiction and non-fiction

TEXT BOOKS

- *SPARK II: An Integrated Course Text for General English*, Department of English, St. Xavier's College (Autonomous), Palayamkottai.
- *Intermediate English Grammar* by Raymond Murphy. Cambridge University Press, 2019.

REFERENCE

- *Spoken English: A Foundation Course* by Kamalesh Sadanand and Susheela Punitha, Orient Longman Private Limited, 2008, ISBN 81-250-3467-6.
- *Spoken English for You* by G. Radhakrishna Pillai and K. Rajeevan, Emerald Publishers, 1987, ISBN 978-81-7966-023-.
- *Better English Pronunciation* by Thakur KBP Sinha, Vijay Nicole Imprints, 2005, ISBN 81-8209-068-7.
- Bhatnagar, R. P. *English for Competitive Examinations*, India: Trinity Press, 2017.
- Sinha, R. P. *Current English Grammar and Usage with Composition*. India: Oxford University Press, 2018.

QUESTION PATTERN

SEMESTER EXAMINATION

Marks

PART A – MCQs (7 from each of the Units I, II, and 6 from Unit III)	20
PART B – Compulsory Units I, II & III - Short answers/ ERC/Grammar (5X3)	15
• Unit I - Short answer/ ERC • Unit II - Short answer/ ERC • Prefixes • Suffixes • Adjectives	
PART C – Compulsory Unit III (5x7)	35
• Adjectives • Use of 'who' & 'where' in combining sentences • Use of 'which' & 'that' in combining sentences • Framing questions – 'Wh –' & 'Yes' / 'No' Questions • Developing Hints into a Paragraph	
PART D – (3x10)	30
• Essay (250 words) Unit I (Either/or) • Essay (250 words) Unit II (Either/or) • Compulsory -Use of Conditional 'If' (Probable & Improbable Conditions)	

TOTAL

100

INTERNAL EXAMINATIONS Marks

PART A - MCQs 6X1(2 from each of the Units I, II & Unit III)	6
--	---

COURSE III

Hours: 6

Course Code: 26UGEL13, 26UGEL33

Credits: 3

LEARNING OUTCOMES

LO1 To involve the learners in reading and interpreting English in poetry and prose (Fiction and Non-fiction)

LO2 To enable learners to write about prescribed literature

LO3 To help learners learn the appropriate use of articles, prepositions and adverbs

LO4 To help learners develop vocabulary register through homonyms, homophones and homographs

LO5 To facilitate in learners, the ability to create a narration based on hints

LO6 To build confidence in the learners to speak English for specific purposes

UNIT – I POETRY (READING AND WRITING SKILLS)

1. William Shakespeare – “All the World’s a Stage”
2. P. B. Shelley – “Ozymandias”
3. Oliver Goldsmith – “The Village Schoolmaster”

UNIT – II SHORT STORIES/ PROSE (READING AND WRITING SKILLS)

1. O. Henry – “The Gift of the Magi”
2. Katherine Mansfield – “A Cup of Tea”
3. Mark Twain – “A Day at Niagara”

UNIT – III GRAMMAR AND VOCABULARY SKILLS

1. Articles
2. Prepositions
3. Adverbs
4. Spotting Errors (Articles/ Prepositions / Adverbs)
5. Homonyms, Homophones, Homographs
6. Constructing a story using hints

UNIT –IV LISTENING AND SPEAKING SKILLS

1. Listening Practice: Listen and Do exercises: Listening to short passages , short stories (Indian and British) , English songs, *Mind your Language* (Episodes:1-2)
2. Pronunciation Practice : Words related to professions
3. Words generally mispronounced
4. Telephonic Conversation
5. Making Suggestions

UNIT – V LISTENING AND SPEAKING SKILLS

1. Complimenting / Congratulating
2. Expressing Sympathy
3. Reading aloud
4. Describing a picture/ Describing a process
5. Personal Conversation (Habits, Hobbies, Future Plan)

COURSE OUTCOMES

Learners will be able to

CO1 Read and understand English in poetry and prose (Fiction and Non-Fiction)

CO2 Write coherent essays about the prescribed literature

CO3 Use articles, prepositions and adverbs appropriately

CO4 Use homonyms, homophones, and homographs appropriately, ensuring clarity and precision in their spoken and written English

CO5 Create a narration from hints

CO6 Speak English confidently in a descriptive as well as expository style

TEXT BOOKS

- *SPARK III: An Integrated Course Text for General English*, Department of English, St. Xavier's College (Autonomous), Palayamkottai.
- *Intermediate English Grammar* by Raymond Murphy. Cambridge University Press, 2019.

REFERENCE

- *Spoken English: A Foundation Course* by Kamalesh Sadanand and Susheela Punitha, Orient Longman Private Limited, 2008, ISBN 81-250-3467-6.
- *Spoken English for You* by G. Radhakrishna Pillai and K. Rajeevan, Emerald Publishers, 1987, ISBN 978-81-7966-023-2.
- *Better English Pronunciation* by Thakur KBP Sinha, Vijay Nicole Imprints, 2005, ISBN 81-8209-068-7.
- Bhatnagar, R. P. *English for Competitive Examinations*, India: Trinity Press, 2017.
- Sinha, R. P. *Current English Grammar and Usage with Composition*. India: Oxford University Press, 2018.

QUESTION PATTERN

SEMESTER EXAMINATION

Marks

PART A - MCQs (7 from each of the Units I, II, and 6 from Unit III)

20

PART B - Compulsory - Units I, II & III (5X3)

15

- Unit I - Short answer/ ERC
- Unit II - Short answer/ ERC
- Articles
- Prepositions
- Adverbs

PART C – Compulsory - Unit III (5x7)

35

- Articles
- Prepositions
- Adverbs
- Homonyms, Homophones, Homographs
- Constructing a story using hints

PART D - (3x10)

30

- Essay (250 words) Unit I (Either/or)

- Essay (250 words) Unit II (Either/or)
- Compulsory -Spotting Errors (Articles/ Prepositions / Adverbs)

TOTAL **100**

INTERNAL EXAMINATIONS

Marks

PART A - MCQs 6X1(2 from each of the Units I, II &Unit III)

6

PART B- Compulsory one question from each of the Units I, II & III

1 Short answer/ 1 ERC/ Grammar (3X3)

9

PART C – Compulsory- (Unit III) (3X5)

15

PART D- (2X10)

20

- Essay - Either /or Units – I & II 250 words

- Compulsory- Grammar/ Composition

TOTAL

50

INTERNAL ASSESSMENTS Marks

Skill based activity – 2x15 30

(Seminar presentation/Spoken English/Critical Podcast/ Video Essay/ Creating a 5–8 slide on a topic/ Composing a poem/ Submitting a relevant photo with description etc.)

TOTAL 30

Viva-Voce Components: 100 Marks

1. Pronunciation: Words related to professions /Words generally mispronounced (25)
2. Conversation: Making Suggestions /Complimenting / Congratulating /Expressing Sympathy / Habits, Hobbies, Future Plan (25)
3. Reading aloud (25)
4. Describing a picture/ Describing a process (25)

COURSE IV

Hours: 6

Course Code: 26UGEL14, 26UGEL24, 26UGEL44

Credits: 3

LEARNING OUTCOMES

LO1 To make learners read and understand intermediate level poetry and prose

LO2 To encourage learners to continue building a vocabulary register as the students interpret, speak, and write about prescribed literature

LO3 To make learners use tenses and concord in meaningful constructions

LO4 To enable learners to employ appropriate synonyms and antonyms in written and spoken communication

LO5 To help learners learn the different types of letters, resumes and the art of composing e-mails and the use of appropriate language

LO6 To build confidence in students to speak English naturally and clearly, moving from basic sounds and reading practice to advanced conversations about books and real-world issues

UNIT – I POETRY (READING AND WRITING SKILLS)

1. John Milton – “On His Blindness”
2. Lewis Carroll – “The Walrus and the Carpenter”
3. Rudyard Kipling – “If”

UNIT – II SHORT STORIES /DRAMA (READING AND WRITING SKILLS)

1. Rabindranath Tagore – “The Postmaster”
2. Ernest Hemingway– “Cat in the Rain”
3. Fritz Karinthy –“The Refund”

UNIT – III GRAMMAR AND VOCABULARY SKILLS

1. Tenses
2. Concord
3. Spotting Errors (Tenses and Concord)
4. Describing a thing / a place / an event
5. Synonyms and Antonyms (Bhatnagar)
6. Letter Writing (Formal & Informal), Resumes and Composing emails

UNIT – IV LISTENING AND SPEAKING SKILLS

1. Listening Practice: Listen and Do exercises: Listening to conversations, announcements, interviews of popular personalities, and *Mind your Language* (Episodes: 3-4)
2. Complaining
3. Apologising
4. Offering encouragement and responding to them
5. Warning Someone

UNIT –V LISTENING AND SPEAKING SKILLS

1. Pronunciation Practice: Vowels and Diphthongs & Strong and Weak forms of words
2. Reading Aloud
3. Issue-based conversation

4. Speaking about prescribed literature
5. Speaking on a given topic

COURSE OUTCOMES

Learners will be able to

CO1 Read, interpret, and analyse intermediate level of English in poetry, prose, and fiction

CO2 Write coherent essays on prescribed literature

CO3 Use the various tense forms accurately with proper subject - verb agreement

CO4 Compose logically organized descriptive paragraphs, formal letters, professional resumes and emails

CO5 Use synonyms and antonyms appropriately, allowing for more expressive, varied, and accurate communication

CO6 Speak English fluently with confidence in an expository as well as analytical style

TEXTBOOKS

- *SPARK IV: An Integrated Course Text for General English*, Department of English, St. Xavier's College (Autonomous), Palayamkottai.
- *Intermediate English Grammar* by Raymond Murphy. Cambridge University Press, 1999.

REFERENCE

- *Spoken English: A Foundation Course* by Kamalesh Sadanand and Susheela Punitha, Orient Longman Private Limited, 2008, ISBN 81-250-3467-6.
- *Spoken English for You* by G. Radhakrishna Pillai and K. Rajeevan, Emerald Publishers, 1987, ISBN 978-81-7966-023-2.
- *Better English Pronunciation* by Thakur KBP Sinha, Vijay Nicole Imprints, 2005, ISBN 81-8209-068-7.
- Bhatnagar, R. P. *English for Competitive Examinations*. India: Trinity Press, 2017.
- Sinha, R. P. *Current English Grammar and Usage with Composition*. India: Oxford University Press, 2018.

QUESTION PATTERN

SEMESTER EXAMINATION	Marks
PART A - MCQs (7 from each of the Units I, II, and 6 from Unit III)	20
PART B- Compulsory- Units I, II & III (5X3)	15
• Unit I - Short answers/ ERC • Unit II - Short answers/ ERC • Tenses • Concord • Spotting Errors (Tenses and Concord)	
PART C – Compulsory- Unit III (5x7)	35
• Tenses	

• Concord • Spotting Errors (Tenses and Concord) • Describing a thing / a place / an event • Synonyms(4) and Antonyms(3)	
PART D - (3x10)	30
• Essay (250 words) Unit I (Either/or) • Essay (250 words) Unit II (Either/or) • Compulsory- Letter Writing/Resumes/ Composing emails	
TOTAL	100
INTERNAL EXAMINATIONS	Marks
PART A - MCQs 6X1(2 from each of the Units I, II & Unit III)	6
PART B- Compulsory one question from each of the Units I, II & III 1 Short answers/ 1 ERC/ Grammar (3X3)	9
PART C –Compulsory (Unit III) (3X5)	15
PART D- (2X10)	20
• Essay - Either /or Units – I & II 250 words • Compulsory- Grammar/ Letter writing/ Composition	
TOTAL	50

INTERNAL ASSESSMENTS Marks

Skill based activity – 2x15	30
(Seminar presentation/Spoken English/Critical Podcast/ Video Essay/ Creating a 5–8 slide on a topic/ Composing a poem/ Submitting a relevant photo with description, etc.)	
TOTAL 30	

Viva-Voce Components: 100 Marks

1. Reading Aloud (25)
2. Issue-based conversation (25)
3. Speaking about prescribed literature (25)
4. Speaking on a given topic (25)

COURSE V

Hours: 6

Course Code: 26UGEL25, 26UGEL35

Credits: 3

LEARNING OUTCOMES

LO1 To introduce learners to the intermediate level of English through prescribed literature

LO2 To make learners read, interpret, and write about prescribed pieces of literature

LO3 To make learners learn complex language structures, the appropriate use of conjunctions and voice forms

LO4 To help learners become familiar with the accurate use of language with an awareness of common errors in language use

LO5 To make learners understand the logical sequence of ideas within a paragraph

LO6 To make learners speak English fluently with confidence, argue both sides of a topic with confidence, and discuss difficult modern issues with logic and ease

UNIT – I POETRY (READING AND WRITING SKILLS)

1. William Wordsworth – “The Solitary Reaper”
2. H.W. Longfellow – “A Slave’s Dream”
3. Robert Frost – “The Road Not Taken”

UNIT – II PROSE/ DRAMA (READING AND WRITING SKILLS)

1. Oscar Wilde - “The Model Millionaire”
2. A. A. Milne – “The Boy Comes Home”
3. Francis Bacon – “Of Friendship”

UNIT – III GRAMMAR SKILLS

1. Synthesis and Transformation of Sentences (Simple, Compound & Complex)
2. Conjunctions
3. Active – Passive Voice
4. Spotting Errors (Simple, Compound & Complex sentences/ Conjunctions/ Active – Passive Voice)

UNIT – IV ADVANCED WRITING/ VOCABULARY AND ANALYTICAL SKILLS

1. Expansion of Ideas / Proverbs
2. Dialogue Writing
3. Words often confused (Bhatnagar)
4. Sentence Arrangement

UNIT – V LISTENING AND SPEAKING SKILLS

1. Listening Practice - Listen and Do exercises: Listening to news reading, directions, stories in American English, and watching movies

2. Pronouncing Words ending with common Inflections (like – ‘logy’ ‘- graphy’ ‘-ation’ etc.),
Pronouncing ‘R’ in different positions
3. Reading and Interpreting
4. Turncoat
5. Expand a Proverb
6. Issue-Based Conversation

COURSE OUTCOMES

Learners will be able to

CO1 Read, interpret and analyse poetic English to understand open possibility of inferences

CO2 Write logically planned essays to address specific questions concerning prescribed literature

CO3 Understand the forms and structural differences in different types of sentences and their specific purposes

CO4 Use complex language structures with appropriate conjunctions and voice forms

CO5 Use vocabulary actively with an awareness of words often confused

CO6 Use Spoken English fluently with confidence and accuracy for specific purposes such as analytical, argumentative, and expository talks

TEXT BOOKS

- *SPARK V: An Integrated Course Text for General English*, Department of English, St. Xavier’s College (Autonomous), Palayamkottai.
- *Intermediate English Grammar* by Raymond Murphy. Cambridge University Press, 1999.

REFERENCE

- *Spoken English: A Foundation Course* by Kamalesh Sadanand and Susheela Punitha, Orient Longman Private Limited, 2008, ISBN 81-250-3467-6.
- *Spoken English for You* by G. Radhakrishna Pillai and K. Rajeevan, Emerald Publishers, 1987, ISBN 978-81-7966-023-2.
- *Better English Pronunciation* by Thakur KBP Sinha, Vijay Nicole Imprints, 2005, ISBN 81-8209-068-7.
- Bhatnagar, R. P. *English for Competitive Examinations*. India: Trinity Press, 2017.
- Sinha, R. P. *Current English Grammar and Usage with Composition*. India: Oxford University Press, 2018.

QUESTION PATTERN

SEMESTER EXAMINATION

Marks

PART A - MCQs (8 from Unit I, 7 from Unit II, and 5 from Unit III)	20
PART B- Compulsory Units I & II – 3 Short answers/ 2 ERC (5X3)	15
PART C – Compulsory - Unit III & IV (5x7)	35

- Synthesis and Transformation of Sentences (Simple, Compound & Complex)
- Conjunctions
- Active – Passive Voice
- Expansion of Ideas / Proverbs
- Words often confused

PART D - (3x10)

30

- Essay (250 words) Unit I & II (Either/or)
- a) Dialogue Writing (5) b) Sentence Arrangement (5)
- Compulsory -Spotting Errors (Simple, Compound & Complex sentences/ Conjunctions/ Active – Passive Voice)

TOTAL

100

INTERNAL EXAMINATIONS Marks

PART A - MCQs 6X1(1 from Units I & II , 5 from Units III & IV)

6

PART B- Units I & II – 2 Short answers/ 1 ERC (3X3)

9

PART C –Compulsory (Units III & IV) (3X5)

15

PART D- (2X10)

20

- Essay - Either /or Units – I & II 250 words
- Compulsory -Grammar/ Letter writing/ Composition

TOTAL

50

INTERNAL ASSESSMENTS Marks

Skill based activity – 2x15 30

(Seminar presentation/Spoken English/Critical Podcast/ Video Essay/ Creating a 5–8 slide on a topic/ Composing a poem/ Submitting a relevant photo with description, etc.)

TOTAL 30

Viva-Voce Components: 100 Marks

1. Reading and Interpreting (25)
2. Turncoat (25)
3. Expand a Proverb (25)
4. Issue-Based Conversation (25)

COURSE VI

Hours: 6

Course Code: 26UGEL36, 26UGEL46

Credits: 3

LEARNING OUTCOMES

LO1 To introduce learners to the advanced level of poetic English through representative pieces, to make them understand the oblique use of language

LO2 To make them read and understand classical English novel

LO3 To familiarise them with advanced language structures and the use of idioms and phrasal verbs

LO4 To make them understand and use different degrees for comparison, and use language for reporting speech

LO5 To acquaint them with the skills of expanding or developing, condensing ideas and responding to advertisements

LO6 To make them organize their professional knowledge into clear speeches, and discuss important world issues with confidence and logic

UNIT –I POETRY (READING AND WRITING SKILLS)

1. John Keats – “La Belle Dame Sans Merci”
2. John Donne – “Death Be Not Proud”
3. Walt Whitman – “O Captain! My Captain!”

UNIT - II FICTION (READING AND WRITING SKILLS)

George Orwell –*Animal Farm*

UNIT – III GRAMMAR AND VOCABULARY SKILLS

1. Degrees of Comparison
2. Direct- Indirect Speech
3. Spotting Errors/Correcting Errors (Comprehensive)
4. Idioms and Phrasal Verbs (Bhatnagar)

UNIT – IV ADVANCED WRITING AND ANALYTICAL SKILLS

1. Précis Writing
2. Essay Writing
3. Responding to the given advertisement
4. Cloze Test

UNIT – V LISTENING AND SPEAKING SKILLS

1. Listening Practice - Listen and Do exercises: Listening to famous speeches, poetry renditions, sports commentary, and TED Talks
2. Pronunciation Practice: Words generally often mispronounced
3. Reading and Interpretation
4. Issue-Based Conversation
5. Public speaking on a subject topic

COURSE OUTCOMES

Learners will be able to

CO1 Read and interpret the oblique language of poetry and write appreciative essays on the prescribed literature

CO2 Read, interpret, and write analytical essays about prescribed literature

CO3 Use advanced grammar structures to report speech and use the three degrees of comparison for intended emphasis

CO4 Use advanced nuances of language such as idioms and phrasal verbs

CO5 Write reflective, descriptive, expository and imaginative essays with appropriate content, and condense material to a précis

CO6 Use English fluently and accurately for public speaking, extempore and other specific purposes

TEXT BOOKS

- *SPARK VI: An Integrated Course Text for General English*, Department of English, St. Xavier's College (Autonomous), Palayamkottai.
- Orwell, George. *Animal Farm*. Maple Classics, 2013.
- *Intermediate English Grammar* by Raymond Murphy. Cambridge University Press, 1999.

REFERENCE

- *Spoken English: A Foundation Course* by Kamalesh Sadanand and Susheela Punitha, Orient Longman Private Limited, 2008, ISBN 81-250-3467-6.
- *Spoken English for You* by G. Radhakrishna Pillai and K. Rajeevan, Emerald Publishers, 1987, ISBN 978-81-7966-023-2.
- *Better English Pronunciation* by Thakur KBP Sinha, Vijay Nicole Imprints, 2005, ISBN 81-8209-068-7.
- Bhatnagar, R. P. *English for Competitive Examinations*. India: Trinity Press, 2017.
- Sinha, R. P. *Current English Grammar and Usage with Composition*. India: Oxford University Press, 2018.

QUESTION PATTERN

SEMESTER EXAMINATION

Marks

PART A - MCQs (7 from Unit I, 8 from Unit II, and 5 from Unit III)	20
PART B – Compulsory -2 ERC from Unit I / 3 Short answers from Units II	15
PART C – Compulsory- Unit III & IV (5x7)	35
• Degrees of Comparison • Direct- Indirect Speech • Précis Writing • Essay Writing • Responding to the given advertisement	
PART D - (3x10)	30
• Essay (250 words) Unit I & II (Either/or) • Compulsory- Spotting Errors (5) Correcting Errors(5) (Comprehensive) • Compulsory- a) Idioms and Phrasal verbs (5) b) Cloze Test (5)	

TOTAL **100**

INTERNAL EXAMINATIONS

Marks

PART A - MCQs 6X1(1 from Units – I & II , 5 from Units III)

6

PART B- Compulsory Units I & II

1 ERC from Unit I /2 Short answers from Units I & II (3X3)

9

PART C –Compulsory (Unit III & IV) (3X5)

15

PART D- (2X10)

20

- Essay - Either /or Units – I & II 250 words

- Compulsory- Grammar/ Composition

TOTAL

50

INTERNAL ASSESSMENTS Marks

Skill based activity - 2x15

30

(Seminar presentation/Spoken English/Critical Podcast/ Video Essay/ Creating a 5–8 slide on a topic/
Composing a poem/ Submitting a relevant photo with description, etc.)

TOTAL 30

Viva-Voce Components: 100 Marks

1. Reading and Interpretation (25)
2. Issue Based Conversation (25)
3. Public speaking on subject related topic (25)
4. Extempore (25)

LEARNING OBJECTIVES

LO1 To facilitate learners' reading advanced English through representative pieces of Literature

LO2 To help learners infer and interpret prescribed literature and write coherent, analytical essays

LO3 To help learners analyse a selected dramatic scene to identify how dialogue and stage directions reveal character motivation and advance the central conflict

LO4 To encourage learners in using English skillfully and creatively to discuss, brainstorm or debate a topic, through active practice

LO5 To equip learners with the soft skills necessary for employability

LO6 To help learners to produce structured reports, engaging blogs and original creative pieces by adapting their writing style to suit different purposes and audiences

UNIT –I DRAMA (READING AND WRITING SKILLS)

1. *Julius Caesar* – Act III, Scene I

2. *Othello* – Act V, Scene II

3. *Hamlet*- Act I, Scene III

UNIT –II FICTIONS (READING AND WRITING SKILLS)

H. G. Wells –*Time Machine*

UNIT –III SOFT SKILLS AND SPEAKING SKILLS (Theory and Practice)

1. Interview Skills*

2. Group Discussion*

3. Debate*

4. Interpersonal Skills*

(* Included for Spoken English Viva Voce and Internal Assessments)

UNIT –IV SOFT SKILLS

1. Time Management

2. Problem-Solving Techniques

3. Teamwork

4. Leadership

UNIT –V ADVANCED WRITING SKILLS

1. Report Writing

2. Blog writing

3. Creative Writing (poem/short story)

COURSE OUTCOMES

Learners will be able to

CO1 Read and understand advanced forms of English in Literature

CO2 Interpret and write analytical essays on topics concerning prescribed pieces of literature

CO3 Speak English fluently and accurately in professional contexts

CO4 Use English effectively and creatively for interviews, group discussions, etc.

CO5 Behave, react, and handle situations connected to employability, using the acquired knowledge of soft skills

CO6 Demonstrate versatility in written communication by producing structured technical reports, engaging digital content for blogs, and original creative works that employ evocative language and narrative techniques

TEXT BOOKS

- *SPARK VII: An Integrated Course Text for General English*, Department of English, St. Xavier's College (Autonomous), Palayamkottai.
- Wells, H. G. *Time Machine*. Oxford University Press, 2017 Ed.
- Alphonse S. J., Xavier. *We Shall Overcome: A Textbook on Life Coping Skills*. ICRDDCE Publication, 2004.

REFERENCE

- Sijwalii B.S. and Indu Sijwali, *General Interview Skills for Both Government and Private Sectors*. Arihant Publications, 2023.
- Soman, Ashok M, *Graduates and Postgraduates Entering the Corporate World*. Himalaya Publishing House, 2023.
- Patnaik, Priyadarshi, *Communication, Logical Thinking, and Public Speaking*. Cambridge University Press, India, 2016.

QUESTION PATTERN

SEMESTER EXAMINATION

Marks

PART A - MCQs (5 from each of the Units I, II, III & IV)

20

PART B- Compulsory - (5X3)

15

ERC from Unit I/ Short answers from Units II, III & IV

- Unit I
- Unit II
- Units III
- Units IV
- Units III/ IV

PART C –Compulsory- Units I, II, III, IV & V (5x7)

35

- Short Essay (200 words)/ Annotation Unit I
- Short Essay Unit II (200 words)
- Short Essay Unit III (200 words)
- Short Essay Unit IV (200 words)
- Creative Writing (poem/short story)

PART D - (3x10)

30

- Essay (250 words) Unit I & II (Either/or)
- Compulsory -Report writing (250 words)
- Compulsory - Blog writing (250 words)

TOTAL

100

INTERNAL EXAMINATIONS		Marks
PART A - MCQs 6X1 (1 from Units I & II , 5 from Units III & IV)		6
PART B- Units I & II – 2 Short answers from Units I & II/ 1 ERC from Unit I (3X3)		9
PART C –Compulsory (Unit III & IV) (3X5)		15
PART D- (2X10)		20
1. Essay - Either /or Units – I & II 250 words		
2. Compulsory - Report writing / Blog writing/ Creative Writing (Unit V)		

TOTAL **50**

INTERNAL ASSESSMENTS Marks

Skill based activity – 2x15 30
 (Seminar presentation/ Video Essay/ Creating a 5–8 slide on a topic/ writing a poem, short story/Mock Interview /Group Discussion/Debate etc.)

TOTAL 30

Viva-Voce Components: 100 Marks

1. Interview Skills: Mock Interview (25)
2. Group Discussion (25)
3. Debate (25)
4. Interpersonal Skills: Conversation (25)

DEPARTMENT OF HUMAN EXCELLENCE
St. Xavier's College (Autonomous), Palayamkottai
Courses Offered

Semester	Category	Course Code	Course Title
I	FC	26UHER11/ 26UHEE11	Religion: Catholic Doctrine / Ethics
II	SEC3	26UHEI21	Integrated Personality Development
III	SEC4	26UHEL31	Life Coping and Entrepreneurial Skills Management
IV	EVS	26UEVS41	Environmental Studies
V	VE	26UVEH51	Human Rights and Social Analysis

NME

Semester	Category	Course Code	Course Title
I	Library	26ULBN11	Foundations of Library Science
I	XRF	26UXRN11	Traditional Knowledge of Indian Medicinal Systems
II	Library	26ULBN21	Information Resources
II	STAND	25USTN21	Rural Development Studies
II	XRF	26UXRN21	Indian Traditional Medicinal Foods
III	XRF	26UXRN31	Food Microbiology
IV	XRF	26UXRN41	Herbal Resources and Their Conservation
IV	MAX Forum	26UMXN41	Society, Economy and Politics in Contemporary India

Common Question Pattern

Internal Test

Part A	Answer ALL the questions in one or two lines	5 x 2 = 10
Part B	Answer ALL the questions, each in a paragraph	3 x 5 = 15
Part C	Write an essay on the following	1 x 10 = 10

Semester Exam

Part A	Answer ALL the questions in one or two lines	10 x 3 = 30
Part B	Answer ALL the questions, each in a paragraph	5 x 8 = 40
Part C	Write an essay on each the following	2 x 15 = 30

RELIGION: CATHOLIC DOCTRINE
(26UHER11)

SEMESTER:I	VE	HOURS:2	CREDITS: 2	TOTALHOURS:30
-------------------	-----------	----------------	-------------------	----------------------

Course Outcomes:

Upon completion of the course the students will be able to

CO1: Recite the Sacraments (K1)

CO2: Identify the challenges of the present day church (K1)

CO3: Associate Old and New testaments of the bible (K2)

CO4: Explain the Church history (K2)

CO5: Discuss the Marian worship (K2)

CO6: Summarize the catholic social teachings (K2)

Unit I: Introduction to Bible (6 Hours)

Bible as a Word of God, its inspiration, the Canon - Old and New Testaments and their interconnectedness - Traditional and modern interpretations

Unit II: Jesus and His Teachings (6 Hours)

Parables of Jesus – Important Teachings of Jesus: Kingdom of God – God’s Mercy – Trust in Providence – Two Commandments of love – Be committed – No condemnation of wealth – No condemnation of sinners – Love of enemies; Prayer: Jesus’ Prayer – Types of Prayer; Jesus the Healer – Types of Miracles of Jesus – Jesus the Liberator

Unit III: A Brief History of the Church & Changes and Challenges of the Modern World

(6 Hours)

The beginnings of the Church - Medieval period and its challenges - The importance of the Second Vatican Council and their decrees – Synodality; Casteism – Ecumenical unity and Inter Religious harmony – Digital world and Religious Faith - Catholic Social Teachings

Unit IV: Introduction to the Sacraments and Trinity (6 Hours)

The origin of the seven sacraments - Their practices and meanings – Trinity: The Father – The Son and the Holy Spirit

Unit V: Introduction to Mariology (6 Hours)

Mary, Mother of God and Jesus - Mary, our Mother and in the Gospels - Mariology in the history of the Church – Mary as a Prophet of revolution

REFERENCES:

- “Faith Matters” material prepared by the Department of Human Excellence.
- Second Vatican Council Documents.

ETHICS
(26UHEE11)

SEMESTER:I	VE	HOURS:2	CREDITS: 2	TOTALHOURS:30
------------	----	---------	------------	---------------

Course Outcomes

After completing this course, the learner will be able to know/understand: Cognitive Level

(K-Level)

CO-1 Describe the Ethical foundations and human values (K2)

CO-2 Identify Ethics and its relationship with religions (K1)

CO-3 Evaluate the personal ethical codes in day-to-day life (K5)

CO-4 Associate ethics in family and society (K3)

CO-5 Apply moral, professional, and personal ethics in academic, workplace, and daily life situations. (K3)

CO-6 Analyse the modern ethical issue (K4)

Unit-I Introduction to Ethics and Human Interface (6 Hours)

Meaning, Nature and Scope of Ethics-Challenges and Importance of ethics-Basic ethical foundations-Human values: Tolerance, Compassion, Rationality, Objectivity. Scientific Attitude, Integrity, Respecting Conscience and Empathy. Mahatma Gandhi and Ethical practices: Non violence, Truth, Non-hatred and love for all, concern for the poorest, objectivity nationalism and Education for man making relation between ends and means.

Unit-II Ethics and Major religions and civilizations (6 Hours)

Ethics and its relationship with Religions- Ten Commandments: Christianity and Judaism tradition-Hinduism- Dharma and Mokhya (out of 4 goals of life Dharma, Artha, Kama and Mokhya),concept of Purusartha, Nisakama Karma (work without attachment to results), Concept of Basudev Kutumba and Peace(Whole including all animals, plants, inanimate beings and human form one world)-Islamic Ethics: Justice, Goodness, Kindness, Forgiveness, Honesty, Purity and piety- Buddhism - Arya AstangikaMarg: Right view, Thought , Speed, Action, Livelihood, Efforts, Attention and Concentration.

Unit-III Personal and Professional ethics (6 Hours)

Moral percepts -Dynamics of personal morality-Moral Conscience-Ethical aspects of Thirukural-Evils of corruption- Professional ethics- Nature, Characteristics, scope, type. Professional Value: Trusteeship, Inclusiveness, Commitment, Sustainability, Accountability, Transparency, Impartiality.

Unit-IV Governance, Family and Social Ethics (6 Hours)

Concept of Good Governance-Principles: Transparency, Accountability, Rule of Law-Ethical Leadership and Public Responsibility-Corruption and Integrity in Public Life-Role of Family in ethical formulations-Respecting persons-Peace and Justice-Human Duties-Respecting Persons and Human Dignity-Equality, Justice and Fairness -Peace, Non-violence and Social Harmony-Tolerance, Pluralism and Social Inclusion.

Unit- V Judicious Use of Technology (6 Hours)

Judicious use of Mobile Phones, Electrical machines, Plastics, Television, Computers and their harmful effects. Ethics and Use of Digital Technology: Cyber ethics-, Ethics of social media: WhatsApp, Face book, Twitter and others.

Recommended Books/e-resources:

- R.R. Gaur, R Sangal, G.P. Bagaria (2009): A Foundation Course in Human Values and Professional Ethics, Excel Books.
- D.R. Kiran (2014) Professional Ethics and Human Values, McGraw Hill Education (India).

- Vivian L Vignoles (2017): Identity: Personal and Social, Chapter to appear in Oxford Handbook of Personality and Social Psychology (2nded.), edited by Kay Deaux and Mark Snyder.
- https://cdn.visionias.in/value_added_material/3b896-ethics.pdf
- Sargolzaei, E., & Nikbakht, M. (2017). The Ethical and Social Issues of Information Technology: A Case Study. International Journal of Advanced Computer Science and Applications, 8(10), 138–146. <https://doi.org/10.14569/ijacsa.2017.081019>
- Mirghaderi, L., Sziron, M., & Hildt, E. (2023). Ethics and Transparency Issues in Digital Platforms: An Overview. AI (Switzerland), 4(4), 831–843. <https://doi.org/10.3390/ai4040042>
- Müller, V. C. (2022). The History of Digital Ethics. Digital Dreams Have Become Nightmares: What We Must Do. <https://doi.org/10.1145/3640479.3640499>
- Course Material Prepared by Department of Human Excellence.

**INTEGRATED PERSONALITY DEVELOPMENT
(26UHEI21)**

SEMESTER: II	SEC3	HOURS: 2	CREDITS: 2	TOTAL HOURS: 30
---------------------	-------------	-----------------	-------------------	------------------------

Course Outcomes:

After completing this course, students will be able to:

CO1: Analyze individual personality traits, habits, and attitudes by utilizing self-awareness frameworks such as SWOC and the Johari Window. (K4)

CO2: Formulate actionable plans to build self-confidence, a positive mindset, and healthy self-esteem for continuous personal growth. (K6)

CO3: Implement self-management techniques, including mindfulness, yoga, and distraction control, to regulate stress and improve discipline. (K3)

CO4: Demonstrate effective interpersonal skills, including rapport building, assertiveness, and conflict management, within group discussions and team environments. (K3)

CO5: Design a systematic roadmap of realistic personal and academic goals using structured goal-setting methodologies. (K6)

CO6: Integrate ethical values, social responsibility, and gender sensitivity into professional conduct and real-life decision-making. (K4)

UNIT-I: Self-Knowledge (6 Hours)

Exploring Habits, Attitudes, Self Awareness – Self introspection - SWOC analysis – Johari Window’s Self identity. Enhancing one’s Self image, Self -Esteem, Building self Confidence and Positive Mind Set.

UNIT-II: Self Management (6 Hours)

Understanding of One’s Life Story- Focusing on Internal Narratives – Self-Talk, Self-Discipline- Managing Change, -Adaptation to change, Managing Distractions, Yoga and Mindfulness -Overcoming Inferiority Complex

UNIT-III: Personal Competence and Goal Setting (6 Hours)

Developing Rapport - Giving and Receiving Constructive Feedback - Assertiveness and Conflict Management Skills - Group Discussion Skills –Goal Setting.

UNIT-IV: Personality Development (6 Hours)

Recognizing the growth in different dimension of Holistic and Integrated Personality Development-Ethical Behavior-Gender Sensitivity and Respect- Civic Responsibility-Social Media Responsibility

UNIT-V: Emotional Well-Being (6 Hours)

Meaning -Types of Emotions- Expressing Emotions- Managing Difficult Emotions - Self-Control-Healthy Relationships- Building Resilience & Coping Skills - -Mental Health Awareness.

Reference Books:

1. Dr.Xavier Alphonse S.J ,We Shall Overcome, ICRDEC Publications,Chennai,2004.
2. Harold R Wallace and L. Ann Masters, Personality Development South- Western Cengage Learning India PL,NewDelhi,2006.
3. Course Material Prepared by Department of Human Excellence.

LIFE COPING AND ENTREPRENEURIAL SKILLS MANAGEMENT

(26UHEL31)

SEMESTER:III	SEC 4	HOURS:2	CREDITS:2	TOTAL HOURS:30
--------------	-------	---------	-----------	----------------

Course Outcomes:

After completion of the Course, the students will be able to

CO1: Explain holistic health including physical, mental, and social wellbeing. (K2)

CO2: Apply healthy lifestyle practices including nutrition, hygiene, and digital wellbeing. (K3)

CO3: Analyze social and professional situations using empathy and ethical reasoning. (K4)

CO4: Apply structured decision-making and problem-solving skills in real-life situations. (K3)

CO5: Demonstrate coping strategies for stress, crisis, and uncertainty. (K3)

CO6: Evaluate addiction risks and design strategies for a healthy lifestyle. (K5)

Unit I: Holistic Health & Lifestyle Management (6 Hours)

WHO's definition of Health – Dimensions of Health – Adolescent Health and Women's Health – Understanding Physical Self – Personal Hygiene and Grooming – Balanced Diet and Nutrition – Healthy Habits and Lifestyle – Lifestyle Diseases and Prevention – Digital Wellbeing (Screen Time, Sleep Cycle, Mental Balance) – Public Health Awareness.

Unit II: Social Intelligence & Relationship Management (6 Hours)

Family Relationship: Values in family relationship, nuclear family, Joint Family, Dependence, Overdependence, Happy family, Broken Family - Caring Elders - Rapport Building with Peers/ Friends, Strangers, Transgenders - Professional Relationship: Officials, Mentors, Staff & Service Personnel- Other centeredness and others point of view and Empathy.

Unit III: Decision-Making & Problem-Solving Skills (6 Hours)

Types of Problems (Academic, Personal, Financial, Social) – Problem-Solving Strategies – Decision-Making Process – Rational and Intuitive Decision-Making – Ignatian Discernment Process – Lateral Thinking and Creativity – Basic Financial Literacy (Needs vs Wants, Saving, Budgeting).

Unit IV: Coping with Stress, Crisis & Change (6 Hours)

Meaning and Types of Stress – Causes of Stress (Academic, Social, Digital) – Stress Management Techniques – Emotional Regulation Strategies – Time Management and Productivity – Crisis Management (Failure, Uncertainty, Loss) – Building Resilience and Adaptability.

Unit V: Addiction Awareness & Personal Safety (6 Hours)

Meaning and Types of Addiction – Substance Addiction – Digital and Internet Addiction – Causes and Effects of Addiction – Prevention and Control Measures – Self-Regulation Techniques – Cyber Safety and Responsible Internet Usage – Seeking Help and Counselling Support.

Activity Collaborators: Anti-drug Club, Women's Forum.

Reference Books:

1. Dr. Xavier Alphonse S.J., We Shall Overcome, ICRDEC Publications, Chennai, 2004.
2. Covey Sean, Seven Habits of Highly Effective Teens, New York, Fireside Publishers, 1998.
3. Carnegie Dale, How to win Friends and Influence People, New York: Simon & Schuster, 1998.
4. Clear, James. 2018. Atomic Habits: An Easy & Proven Way to Build Good Habits & Break Bad Ones. New York: Avery
5. Atomic Habits – James Clear, Avery, 2018.
6. The 7 Habits of Highly Effective People – Stephen R. Covey, Free Press.
7. Emotional Intelligence – Daniel Goleman, Bantam Books.

8. Thinking, Fast and Slow – Daniel Kahneman, Penguin Books.
9. Course Material prepared by the Department of Human Excellence.

ENVIRONMENTAL STUDIES
(26UEVS41)

SEMESTER:IV	EVS	HOURS:2	CREDITS:2	TOTAL HOURS:30
--------------------	------------	----------------	------------------	-----------------------

Course Outcomes:

The students will be able to:

CO1: Describe various natural resources and the fundamental principles of sustainable development to explain resource interdependence. (K1)

CO2: Explain the relationship between biodiversity and various conservation approaches to maintain ecological balance. (K2)

CO3: Apply prevention and mitigation strategies to address specific environmental issues and ecosystem degradation. (K3)

CO4: Illustrate the adverse health impacts of different types of pollution on human populations and ecosystems. (K3)

CO5: Evaluate environmental quality indicators and the effectiveness of climate change mitigation risks. (K5)

CO6: Summarize major international environmental treaties and national legislations aimed at environmental protection. (K2)

Unit I: Natural Resources (6 Hours)

Environment – Definition; Overview of natural resources: definition, types of natural resources. Biotic and abiotic, renewable and non-renewable resources. Water resources: types, over-exploitation, issues, challenges, water scarcity, conflicts. Soil and mineral resources: important minerals, problems, soil as a resource. Energy resources: sources, conventional and non-conventional, implications. (IKS- Traditional water conservation methods (e.g., temple tanks, ooranis, johads). Indigenous agricultural practices and soil conservation methods.)

Unit II: Environmental pollution and Health (6 Hours)

Natural and man-made disasters and their impacts of environment and management. Pollution: definitions, natural and man-made pollution. Different types of pollution- Air, Water, Soil, Noise, Radioactive and solid waste pollution: Sources of pollution, different types of pollutants, effects of pollution in environment and human health, prevention and control of pollution. (IKS- Traditional waste management practices. Herbal and indigenous methods to reduce pollution impacts.)

Unit III-Conservation of Biodiversity and Ecosystems (6 Hours)

Biodiversity and its distribution: Levels and types, India and world, hotspots, threat categories. Ecosystems and ecosystem services: major types in India, basic characteristics, significance. Threats to biodiversity and ecosystems: land use, commercial exploitation of species and invasive species. Types of Biodiversity conservation (*In-situ and Ex-situ*). (IKS- Sacred groves and community-based conservation practices, Role of indigenous communities in biodiversity protection)

Unit IV: Climate change: Impacts, Adaptation and Mitigation (6 Hours)

Climate change: structure and different layers of atmosphere, Impacts, vulnerability and adaptation to climate change. Mitigation of climate change: GHGs types, sources, impacts and control. Importance of 1.5 °C and 2.0 °C Global warming and Ozone depletion. Concept of carbon intensity, energy intensity and carbon neutrality; policy instruments, carbon capture and storage, climate justice. Anthropogenic factors - Human over population, over consumption, pollution, Mining, Transport, Environmental degradation and Impact of human activities. (IKS- Traditional climate-resilient farming practices. Indigenous housing designs for climate adaptation.)

Unit V: Environmental Treaties, Legislation and Sustainable Development (6 Hours)

Overview of instruments of international cooperation: bilateral, multilateral, conventions and protocols, COPs. Major International Environmental Agreements: CBD, CITES, UNCCD, UNFCCC. Major Indian Environmental Legislations: acts, rules, sites, areas, zones and judgments. Introduction to sustainable development: SDGs, targets and indicators,

challenges and strategies. Principle of sustainable development, international efforts of sustainable development and sustainable development in India: Perspective and strategies. (IKS- Community based natural resource management models.)

Skill-Based Activities:

Unit-I	➤ Field observation of local water bodies ➤ Preparation of a household resource audit report ➤ Case study analysis on sustainable practices
Unit-II	➤ Air and water quality observation survey ➤ Preparation of eco-friendly products (natural cleaners, composting) ➤ Awareness campaign design
Unit-III	➤ Biodiversity documentation of campus/local area ➤ Preparation of herbarium or digital biodiversity register
Unit-IV	➤ Carbon footprint calculation (individual/department level) ➤ Tree plantation and climate awareness drive
Unit-V	➤ Mock COP session ➤ Policy analysis and presentation ➤ Preparation of sustainability action plan for the campus

General Suggestions:

- Educational visit to Xavier Solai be organized as a common activity for all students.
- Include activity based and project based assignments.
- Conduct orientation programs for EVS faculty on IKS and skill based pedagogy.
- Students examine environmental problems in their local communities and develop solutions to address them.

Reference Books:

1. Singh, J.S., Singh, S.P., Gupta, S.R. (2006). Ecology, Environment and Resource Conservation. Anamaya Publications.
2. Harris, Frances (2012). Global Environmental Issues, 2nd Edition. Wiley- Blackwell.
3. Krishnamurthy, K.V. (2003). Textbook of Biodiversity, Science Publishers, Plymouth, UK.
4. Ahluwalia, V. K. (2015). Environmental Pollution, and Health. The Energy and Resources Institute (TERI).
5. Pittock, Barrie (2009). Climate Change: The Science, Impacts and Solutions. 2nd Edition. Routledge.
6. Ministry of Environment, Forest and Climate Change (2019). A Handbook on International Environment Conventions & Programmes.
7. KanchiKohli, Manju Menon (2021). Development of Environment Laws in India, Cambridge University Press.

HUMAN RIGHTS AND SOCIAL ANALYSIS

(26UVEH51)

SEMESTER:IV	VE	HOURS:2	CREDITS:2	TOTAL HOURS:30
-------------	----	---------	-----------	----------------

Course Outcomes:

Upon completion of the course, the students will be able to

CO1: Recall key concepts of rule of law, democracy, equality, human dignity, citizenship, social justice, secularism and human rights.(K1)

CO2: Explain the Preamble to the Constitution of India, Fundamental Rights, Directive Principles, civil and political rights, socio-economic and cultural rights and collective rights.(K2)

CO3: Apply constitutional principles and human rights concepts to contemporary social issues. (K3)

CO4: Analyze interrelationships among inequalities, social structures, social problems, and reform initiatives in India. (K4)

CO5: Evaluate the effectiveness of constitutional provisions in promoting equality and social justice.(K5)

CO6: Design strategies fostering equality, communal harmony, responsible democratic citizenship and civic participation. (K6)

Unit I: Understanding basic concepts (6 Hours)

Understanding of key concepts, their meaning and significance in today's context – Rule of law, democracy, equality, human dignity, citizenship, social justice, secularism, human rights, fundamental rights and constitutional values.

Unit II: Classification of Human Rights (6 Hours)

Civil and Political rights, socio-economic and cultural rights collective rights or group rights – Preamble to the Constitution of India, Fundamental Rights - Equality rights, personal freedom and right to life, rights against arbitrary arrest and illegal detention, Rights against exploitation, Religion Freedom, Minority rights and Fundamental Duties (Art. 51A)

Unit III: Indian Social System (6 Hours)

Social Analysis - Social system and its components, Inequalities, caste structures and manifestation, Patriarchy and violence against women, Gender and sexual Minorities– A land of cultural linguistic and religious diversity –secular ethos – religious -fundamentalism-Indian politics -Interdependence of human being and society

Unit IV: Social Problems (6 Hours)

Indian Economic inequality and Poverty - Caste Discrimination : Untouchability, honour killing - Reservation policy, and Dalit empowerment - illiteracy and its effects Child labour, child abuse, bonded labour and their effects

Unit V: Social Reformers (6 Hours)

Promoting social justice and equality, women's rights, and eradication of caste discrimination - Dr. B. R. Ambedkar, Mahatma Gandhi, Dr. Muthulakshmi Reddy, Savitribai Phule, Fathima Sheik, Pandita Ramabai and E. V. Ramasamy - Focusing on service to the marginalized, healthcare, education, and human values

Reference Books:

1. P.N. Sharma, "Social problems and issues in India", Bharat Book Centre, 2014, New India
2. The Reality Reloaded, Gurjot S. Kaler, Chandigarh, India, 2018
3. Course Material Prepared by the Department of Human Excellence
4. Activity-based learning will be conducted in collaboration with the Democracy Forum and Electoral Literacy Club to promote democratic values, constitutional awareness, and responsible citizenship.

PROPERTIES OF MATTER AND ACOUSTICS
COURSE CODE : 26UPHC11

SEMESTER - I CORE – T1 HOURS – 6 CREDITS – 6 TOTAL HOURS : 90

Objective:

To expose the students to the fundamentals of properties of matter and sound.

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

- CO1 : identify the materials suitable for construction of buildings, based on the moduli of elasticity.
- CO2 : have knowledge on properties of liquids and its determination.
- CO3 : understand the physics of sound and its applications
- CO4 : know the different methods of producing ultrasonic waves and its applications
- CO5 : the concepts of acoustic comfort and better understanding of the theories used in building acoustics

UNIT - I : Elasticity

(18 Hours)

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

(18 Hours)

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

UNIT - III : Fluid Dynamics

(18 Hours)

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 a capillary tube – Poiseuille's formula – corrections – terminal velocity and Stoke's formula – variation of viscosity with temperature.

UNIT - IV : Waves and Oscillations

(18 Hours)

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

(18 Hours)

Intensity of sound – decibel – loudness of sound – reverberation – Sabine's reverberation formula – acoustic intensity – factors affecting the acoustics of buildings.

Ultrasonic waves: production of ultrasonic waves – Piezoelectric crystal method –

magnetostriction effect – application of ultrasonic waves

TEXT BOOKS :

1. D.S.Mathur, 2010, Elements of Properties of Matter, S.Chand & Co.
2. BrijLal & N. Subramanyam, 2003, Properties of Matter, S.Chand & Co.
3. D.R.Khanna & R.S.Bedi, 1969, Textbook of Sound, Atma Ram & 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.

CORE - PRACTICAL

PROPERTIES OF MATTER AND ACOUSTICS (Any Seven)

COURSE CODE : 26UPHC12

SEMESTER - I CORE – P1 HOURS – 2 CREDITS – 2 TOTAL HOURS : 30

OBJECTIVES : To apply various physics concepts, to understand Properties of Matter, set up experiments, verify theories, quantify and analyse the theory, able to do error analysis and correlate results.

1. Determination of rigidity modulus without masses using Torsional Pendulum.
2. Determination of rigidity modulus with masses using Torsional Pendulum.
3. Determination of Young's modulus by uniform bending – Pin and Microscope.
4. Determination of Young's modulus by non-uniform bending – Scale & Telescope.
5. Determination of Young's modulus by Cantilever – Load Depression Graph.
6. Determination of rigidity modulus by Static Torsion.
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 Poiseuille's Flow method.
10. Determination of g using Compound Pendulum.

PHYSICS FOR EVERYDAY LIFE (NME)
COURSE CODE : 26UPHN11

SEMESTER - I SEC – 1 HOURS – 2 CREDITS – 2 TOTAL HOURS : 30

OBJECTIVES : To expose the students with the applications of physics in day to day activities

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

CO1: to know where all physics principles have been put to use in daily Life.

CO2 : to understand the concepts of mechanical objects, Optics and Lasers.

CO3 : to know the applications of Solar energy.

CO4 : to appreciate the concepts with a better understanding.

CO5 : to know about Indian scientists who have made significant contributions to Physics.

UNIT - I : Mechanical Objects (6 Hours)

Spring scales - bouncing balls - roller coasters - bicycles - rockets

UNIT - II : Optical Instruments And Laser (6 Hours)

Vision corrective lenses - polaroid glasses - UV protective glass - Digital camera - holography and laser.

UNIT - III : Physics of Home Appliances (6 Hours)

Bulb - Tube light - fan - hair drier - television - air conditioner - microwave oven

UNIT - IV : Solar Energy (6 Hours)

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

UNIT - V : Indian Physicists and their Contributions (6 Hours)

Sir C.V.Raman - Homi Jehangir Bhabha - Vikram Sarabhai - Subrahmanyam 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.

HEAT AND THERMODYNAMICS

COURSE CODE : 26UPHC21

SEMESTER - II CORE – T2 HOURS – 6 CREDITS – 5 TOTAL HOURS : 90

OBJECTIVES :

To understand the phenomena connected with various units of measurement of temperature, knowing the concept of specific heat capacities of matter, transmission of heat, concept of lowering the temperature, liquefying gases and process of making heat to do mechanical work.

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

- CO1 :** acquire knowledge on how to distinguish between temperature and heat.
- CO2 :** derive the efficiency of Carnot's engine. Discuss the implications of the laws of thermodynamics in diesel and petrol engines.
- CO3 :** analyze performance of thermodynamic systems viz efficiency by problems. Gets an insight into thermodynamic properties like enthalpy & entropy.
- CO4 :** study the process of thermal conductivity and apply it to good and bad conductors.
- CO5 :** quantify different parameters related to heat, relate them with various physical parameters and analyse them.
- CO5 :** interpret classical statistics concepts such as phase space, ensemble, Maxwell - Boltzmann distribution law. Develop the statistical interpretation of Bose-Einstein and Fermi-Dirac.

UNIT-I : Thermometry and Calorimetry (18 Hours)

Platinum resistance thermometer - Calendar and Griffith's bridge - Thermoelectric effect - Seebeck effect - Thermoelectric thermometers - International temperature scale - Thermistor - Specific heat capacity of solids - Regnault's method of mixtures(solid) - specific heat capacity of liquids - Calendar and Barnes method - Specific heat capacity of gases - C_p and C_v - Meyer's relation - C_v by Joly's differential steam calorimeter method - C_p by Regnault's method.

UNIT-II : Low Temperature Physics (18 Hours)

Joule - Kelvin effect - Liquefaction of Air - Linde's Process -liquefaction of hydrogen - liquefaction of helium - Kammerling - Onne's method - Helium I and II - Lambda point - Production of low temperatures - adiabatic demagnetization - Practical applications of low temperature - Refrigerators and air - conditioning machines - Super fluidity - Application of super fluidity.

UNIT - III: Transmission of Heat (18 Hours)

Conduction - Coefficient of thermal conductivity - Rectilinear flow of heat along a bar - Convection - Lapse rate - Stability of the atmosphere - Newton's law of cooling - determination of specific heat capacity of liquid - Radiation - black body - Kirchhoff's law - Stefan Boltzmann law - energy distribution in blackbody spectrum - Wien's law - Rayleigh Jean's law - Planck's law - Solar constant - Water flow pyroheliometer.

UNIT - IV: Kinetic Theory of Gases**(18 Hours)**

Kinetic Theory of gases - Assumptions - Molecular collisions - Mean free path - Expression for mean free path - Transport phenomenon - Brownian motion and its features - Expression for viscosity, Diffusion and thermal conductivity of gas - Experimental verification - Vander walls equation of state - Determination of Vander walls constant - Relation between Vander Wall's constant and critical constants.

UNIT - V: Thermodynamics**(18 Hours)**

Zeroth and first law of thermodynamics - Reversible and irreversible processes - Isothermal process - Adiabatic process - Gas equation during adiabatic process - Work done during adiabatic and isothermal process - second law of thermodynamics - Carnot's engine - Efficiency - Entropy - Change of entropy in reversible and irreversible processes - Temperature - Entropy diagrams - Physical significance of entropy - Change of entropy when ice converted into steam - Third law of thermodynamics - Extensive and Intensive thermodynamic variables - Distinction between them - Maxwell thermodynamical relations - Clausius - Clapeyron equation.

TEXT BOOKS:

1. Heat and Thermodynamics – Brijlal and Subramanyam, S.Chand & Co, 16th Edition, New Delhi, 2005.
2. Heat and Thermodynamics – D.S. Mathur, Sultan Chand & Sons, 5th Edition, New Delhi, 2014.
3. Thermal Physics – R. Murughesan and Kiruthiga Sivaprasath, S.Chand & Co, 2nd Edition, New Delhi, 2008.

BOOKS FOR REFERENCE:

1. Heat & Thermodynamics – J.B. Rajan, SC Publisher, New Delhi, 1985.
2. Concepts of Physics Volume I and II – H.C. Varma, Bharati Bhawan Publishers, New Delhi, 2015.
3. M. Narayanamoorthy and N. Nagarathinam, Heat, National Publishing Co, Chennai, 8th Edition, 1987.

HEAT AND THERMODYNAMICS – PRACTICAL
COURSE CODE : 26UPHC22

SEMESTER - II CORE – P2 HOURS – 2 CREDITS – 3 TOTAL HOURS : 30

COURSE 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

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 Specific heat capacity of solid.
4. Determination of Stefan's constant for Black body radiation.
5. Verification of Stefan's - Boltzmann law.
6. Determination of Thermal conductivity of rubber tube.
7. Newton's law of cooling - verification.
8. Determination of Emissivity of a surface.
9. Specific heat capacity of a liquid.
10. Specific heat capacity by the method of mixtures.

**NON MAJOR ELECTIVE
NUCLEAR ENERGY AND ITS APPLICATIONS
(COURSE CODE: 26UPHN21)
(For students of other Major)**

SEMESTER - II SEC- 2 HOURS – 2 CREDITS – 2 TOTAL HOURS : 30

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

- CO1 : know about the large scale demand of energy for meeting day to day domestic, and industrial requirements.
- CO2 : understand the differences between nuclear fission and nuclear fusion.
- CO3 : understand the functioning of various nuclear reactors in india.
- CO4 : understand the advantages of nuclear energy
- CO5 : create an awareness about nuclear treaty

Unit - I: Nuclear Energy (10 Hours)

Introduction - Atomic structure - Chain reaction - Nuclear fusion - Atom bomb - Nuclear fission - Hydrogen bomb - Nuclear reactors - Stellar energy - Nuclear energy - Nuclear fuel - Applications of nuclear physics in Archeology.

Unit - II: Reactors (10 Hours)

Types of reactors in Tamil Nadu - Koodankulam Nuclear reactor - Reactors in India - Breeder reactor - Uranium ore - sources in India - Advantages and disadvantages - Advantages and disadvantages of Nuclear energy - Chernobyl disaster - Nuclear hazards.

Unit - III: Nuclear Treaty (10 Hours)

Nuclear treaty - Hyde Act - Indo-American agreement of nuclear treaty.

TEXT BOOKS:

1. 1. R.Murugesan - Modern Physics, S. Chand and Company, Edition, 2010.
2. 2. Irwing Kaplan - Nuclear Physics, Narosa Publishing House, Edition 2002.

ELECTRICITY AND MAGNETISM
(COURSE CODE: 26 UPHC 31)

SEMESTER - III CORE – T3 HOURS – 6 CREDITS – 5 TOTAL HOURS : 90

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

- CO1 : remember the physical aspects on electricity and magnetism and to apply the principles in day today life.
- CO2 : learn the concept of charges and how they interact with each other.
- CO3 : apply knowledge of electricity and magnetism to explain natural physical processes and related technology advances.
- CO4 : identify and apply appropriate theoretical techniques to solve a range of different problems in electricity and magnetism.
- CO5 : have a basic exposure and grasp on how experimental equipments related to electricity and magnetism can be used.
- CO6 : analyse the basic concept and the properties of elements in AC circuits and their applications.

UNIT - I Electric Field

(18 Hours)

Coulombs law in vector form - Electric field - Electric field due to a point charge - Electric dipole - Electric field due to an electric dipole at an axial point, a point on the equatorial line - Electric lines of force - Gauss law - proof - applications - Field due to (i) uniformly charged non conducting sphere and (ii) uniformly charged conducting sphere.

UNIT - II (A) Electric potential

(18 Hours)

Electric potential - Potential difference - relation between electric field and electric potential equipotential surface - Potential at a point due to (i) point charge (ii) uniformly charged non-conducting sphere - Electrical potential energy.

(B) Capacitors

Principle of capacitor - Spherical capacitor - cylindrical capacitor - Capacitance of parallel plate capacitor - effect of dielectrics in capacitors - Capacitors in series and parallel - Energy stored in a charged capacitor - Loss of energy on sharing of charges between two capacitor.

UNIT - III AC circuits

(18 Hours)

Alternating current: Emf induced in a coil rotating in a magnetic field - Peak value - Mean value - Effective value - Impedance - AC circuits: circuit containing L and R in series - LCR series resonance circuit - LCR parallel resonance circuit. Transient current: growth and decay of current in LR circuit - Growth and decay of charge in LCR circuit - Measurement of high resistance by leakage.

UNIT - IV (A) Magnetic effect of electric current

(18 Hours)

Biot-Savart law - Magnetic induction at a point due to a straight conductor carrying current - Force on a current carrying conductor in a magnetic field - Force between two parallel current carrying conductors - Torque on a current loop in a uniform magnetic field - Moving coil ballistic galvanometer - Current and Voltage sensitivities of a moving coil galvanometer - determination of capacity of a capacitor.

(B) Electromagnetic induction

Self inductance - Self inductance of a long solenoid - Owen's bridge - Mutual inductance
- Determination of mutual inductance - Coefficient of coupling.

UNIT - V Magnetic properties of materials (18 Hours)

Classification of magnetic materials - Magnetic induction - Magnetization - relation between B, H & M - Magnetic susceptibility and permeability - Electron theory of dia, para and ferromagnetism - Langevin's theory of diamagnetism and paramagnetism - Failures of Langevin's theory - Weiss theory of ferromagnetism - Experiment to draw M-H curve - Energy loss due to hysteresis.

TEXT BOOKS:

1. Murugesan R. - Electricity and Magnetism, S. Chand and Company Ltd. Edition 10th Revised Edition, 2017.
2. Brijlal and Subramaniyan - Electricity and Magnetism, S. Chand and Company Ltd., Reprint 2009.

REFERENCE BOOKS:

1. S.G. Starling - Electricity and Magnetism, Longmann Green 8th Edition 2000.
2. Chakraborty - Electricity & Magnetism, New Age International, 2008.
3. N.K. Sehgal & Chopra - Electricity & magnetism, Sultan Chand & Sons, 2nd Edition, 2000.

PRACTICAL - (ELECTRICITY AND MAGNETISM)
(COURSE CODE: 26 UPHC 32)

SEMESTER - III CORE - P3 HOURS - 2 CREDITS - 3 TOTAL HOURS : 30

1. Figure of Merit - Spot Galvanometer.
2. Thermo Emf Determination - Spot Galvanometer.
3. Self Inductance - Maxwell's Bridge.
4. Self Inductance - Owen's Bridge.
5. Comparison of Capacitance -De Sauty's Bridge
6. Calibration of Low range Voltmeter - Potentiometer.
7. LCR Series Resonance Circuit
8. LCR Parallel Resonance Circuit.
9. Absolute Capacity of a Capacitor.
10. High Resistance by Leakage.

SKILL ENHANCEMENT COURSE
SPACE SCIENCE AND COSMOLOGY
(COURSE CODE: 26 UPHS 31)

SEMESTER - III SEC - 5 HOURS – 2 CREDITS – 2 TOTAL HOURS : 30

OBJECTIVES:

To enable the learner to have better understanding and insight of glimpses of the earth's atmosphere, solar system, galaxy and the universe.

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

CO1 : understand the solar atmosphere and its effect on earth.

CO2 : understand the origin of the solar system.

CO3 : explore the space mission to moon and other planets.

CO4 : learn the basic information about the classification of stars.

CO5 : learn the formation of black holes and their properties.

UNIT - I (6 Hours)

Velocity - acceleration - Newton's law of gravitation - acceleration due to gravity - gravity near the earth's surface - above the earth's surface - below the earth's surface.

UNIT - II (6 Hours)

Equator - prime meridian - latitude - longitude - escape velocity - light year - Kepler's laws - Earth's atmosphere and its composition.

UNIT - III (6 Hours)

Geostationary orbit - geosynchronous orbit - artificial satellites - space missions of ISRO, NASA and ESA.

UNIT - IV (6 Hours)

Big-bang theory - Hubble's law - discovery of Higg's boson - planets - satellites - meteors - asteroids - comets.

UNIT - V (6 Hours)

Solar system - Galaxy - milky way galaxy - evolution and death of stars - black hole - gravitational waves.

TEXT BOOKS:

1. Arnab Rai Chaudhuri - Astrophysics for Physicists, Cambridge University Press, Reprint 2012.

REFERENCE BOOKS:

1. Baidyanath Basu - An introduction to Astrophysics, Prentice Hall of India Pvt. Ltd., 2nd Edition, 2012.
2. Cesare Emiliani - Planet Earth, Cambridge University Press, 1997.
3. William Lowrie - Fundamentals of geophysics, Cambridge University Press, 1997.
4. Encyclopedia Britannica for space.

OPTICS AND LASERS

(COURSE CODE: 26 UPHC41)

SEMESTER - IV CORE - T4 HOURS - 4 CREDITS - 4 TOTAL HOURS : 60

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

CO1 : gain good knowledge of optics.

CO2 : understand the developments in photonics .

CO3 : understand the various optical instruments.

CO4 : understand the differences between interference, diffraction and polarization.

CO5 : understand the basic concepts in lasers.

CO6 : understand the camera, size and resolution power.

UNIT - I: Optical Instruments

(12 Hours)

Eye - Camera - Size of an object - The simple magnifier - Compound Microscope - Refracting astronomical telescope - Compound microscope - Resolving Power - Rayleigh's criterion of resolution - Resolving power of a telescope and prism - Constant deviation spectroscope.

UNIT - II : Interference of Light

(12 Hours)

Young's Double - Slit Experiment - Optical Path Difference between the waves - Fresnel biprism - Experimental arrangement - Determination of wavelength of light - Interference Fringes with white light - Lateral displacement of fringes - Haidinger's fringes - Air wedge theory and experiment - Colours of thin films and CD - Newton's Rings - Determination of wavelength of light - Refractive index of a liquid - Michelson's interferometer - Applications of Michelson's Interferometer.

UNIT - III: Diffraction

(12 Hours)

Introduction - Zone plate - Diffraction due to a narrow slit - Fraunhofer diffraction at double slit - Theory of plane transmission grating - Oblique incidence - Absent spectra with a diffraction grating - Determination of wavelength of a spectral line using the transmission grating - Dispersive power of grating.

UNIT - IV: Polarization

(12 Hours)

Introduction - Polarization by double refraction - Fabrication of linear polarizer - Nicol Prism - Polaroid sheets - Huygen's explanation of double refraction - Types of polarized light - Quarter wave plate - Half wave plate - Production and detection of plane, elliptically and circularly polarized light - Babinet compensator - Double image polarizing prisms - Optical activity - Fresnel's explanation of optical rotation - Laurent's half shade polarimeter

- Application - LCD.

UNIT - V: Lasers

(12Hours)

Introduction - Einstein relations (no derivations) - Light Amplification - Population inversion - Properties of laser - Components of Laser : Fundamentals of Second Harmonic Generation - Active medium - Pumping - Optical resonant cavity - Principal pumping schemes - Ruby laser - Helium-neon laser - Carbon dioxide laser - Laser beam characteristics - Applications - Fibre optics - Introduction - Types of fibre - Numerical aperture and Acceptance angle.

TEXT BOOK:

N. Subrahmanyam, Brijlal & M.N. Avadhanulu - A Textbook of Optics, S. Chand & company Ltd, New Delhi, Twenty Fourth Revised Edition, 2010.

REFERENCE BOOKS:

1. Anchal Srivastava, R.K. Shukla - Optics, S. Chand & Com. 2000.
2. R. Murugesan – Optics and Spectroscopy, S. Chand & Com. 2010.
3. A.B. Gupta - Modern Optics, Books and Allied (P) 2010.
4. K. John Robertson - Introduction to Optics, D van Nostr and Company IV, 2000.
5. Khanna & Gulati - Fundamental of Optics, R. Chand & Com V, 2000.
6. Francis Jenkins and Harvey E. White - Fundamentals of Optics, Tata McGraw-Hill , Edition, Fourth Edition, 2011.
7. S.P.Singh, J.P.Agarwal, Optics, Pragathi Prakashan, 2003.

PRACTICALS (OPTICS AND LASERS)
(COURSE CODE: 26 UPHC 42)

SEMESTER - IV CORE - P4 HOURS - 2 CREDITS - 2 TOTAL HOURS : 30

1. Dispersive power of a prism using spectrometer.
2. Grating - Normal incidence using spectrometer.
3. Grating - Oblique incidence using spectrometer.
4. Air wedge - Thickness of insulation.
5. Newton's Rings.
6. Effective focal length of lenses in contact.
7. Effective focal length of lenses (two thin convex lenses) out of contact.
8. Effective focal length of lenses (one convex and other concave) out of contact.
9. Polarimeter.
10. Optic Bench.

MECHANICS – (DISCIPLINE SPECIFIC)
(COURSE CODE: 26 UPHE 42)

SEMESTER - IV EC - T5 HOURS – 4 CREDITS – 4 TOTAL HOURS : 45

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

CO1 : understand the various conservation laws in mechanics.

CO2 : understand the basic concepts in moment of inertia.

CO3 : learn the various theories on hydrostatics and hydrodynamics

CO4 : solve problems in hydrodynamics and hydrostatics.

CO5 : learn the classical mechanics in detail.

UNIT – I : Conservation Laws

(9 Hours)

Work energy theorem - Conservative force - Potential energy - Law of conservation of energy - Application of law of conservation of energy - ballistic pendulum - Two body problem and Reduced mass - Linear momentum - Elastic and Inelastic collision - Direct and Oblique impacts - Direct impact between two smooth spheres - Loss of kinetic energy due to direct impact between two smooth spheres.

UNIT – II : Moment of Inertia

(9 Hours)

Moment of inertia of a rigid body - Radius of Gyration - Theorem of Parallel axes - Theorem of Perpendicular axes - Moment of inertia of a solid cylinder - Moment of inertia of a solid sphere about a diameter - Gyroscope.

UNIT – III : Hydrodynamics

(9 Hours)

Introduction - Gradient, Divergence and Curl - Fundamentals of Hydrodynamics - Some important types of fluid flow - Equation of continuity for fluid flow - Euler's Hydrodynamical Equations of motion.

UNIT – IV : Hydrostatics

(9 Hours)

Introduction - Thrust on a plane surface immersed in a liquid at rest - Laws of floatation - Metacentre and stability of floating bodies - Determination of Metacentric height of a Ship - Principle of working of submarine.

UNIT – V : Classical Mechanics

(9 Hours)

Mechanics for a System of Particles - Constraints - Degrees of freedom - Phase Space - Generalised Coordinates - Principle of Virtual Work - D'Alemberts Principle - Lagrange's equation for a system containing Dissipative forces - Applications.

TEXT BOOKS:

1. Ubaldraj - Mechanics and Acoustics, Indira Publications, Marthandam, Revised Edition, 2003.
2. Ubaldraj - Mechanics, Indira Publications, Marthandam, 1998.
3. Ubaldraj - Mechanics and Thermal physics, Indira Publications, Marthandam, Revised Edition, 2003.

REFERENCE BOOKS :

1. John Robert Taylor - Classical Mechanics, University Science Books, 2005.
2. T.W.B Kibble, Frank H. Berkshire - Classical mechanics, Imperial College Press, 2004.
4. Herbert Goldstein - Classical Mechanics, Addison Wesley Pub.Co, 1980.
5. Goldstein - Classical Mechanics - Third Edition, Pearson Education India, 2002.

ELECTRONICS - I
(COURSE CODE: 26 UPHC51)

SEMESTER - V CORE - T5 HOURS - 5 CREDITS - 4 TOTAL HOURS : 75

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

CO1 : understand the working of electronic devices.

CO2 : apply these techniques in practical circuits

CO3 : develop the skill in handling instruments

CO4 : understand the various characteristics pertaining to diodes and its applications

CO5 : understand the various biasing techniques.

UNIT I: Diode Characteristics **(15 Hours)**

Constant voltage source - Constant current source - Maximum power transfer theorem - Norton's Theorem - Thevenin's theorem - V-I characteristics of a PN junction diode - Half wave rectifier - Full wave rectifier - Bridge rectifier - Calculations of dc current, r.m.s value of current, rectifier efficiency, ripple factor in each case - Filter circuits - Types of filter circuits.

UNIT II: Diode Applications **(15 Hours)**

Zener diode - Equivalent circuit - Zener diode as voltage stabilizer - LED - V-I characteristics - Advantages - Applications - Photo diode - Characteristics - Applications - Clipping and Clamping circuits - Differentiator and Integrator using passive elements - Tunnel diode - Oscillator - Varactor diode - Applications of Varactor diode - Shockley diode.

UNIT III: Transistor Characteristics and Biasing Techniques **(15 Hours)**

Junction transistor - Working of a transistor - Transistor action - Transistor characteristics - CB, CE, CC - Comparison between the three configurations - Alpha and beta of a transistor - Operating point - Faithful amplification - Transistor biasing - Stabilization - Need for stabilization - Stability factor - Requirements of a biasing circuit - Voltage divider biasing circuit.

UNIT IV: Single stage, Multistage and Power Amplifiers **(15 Hours)**

Single stage transistor amplifier - Classification of amplifiers - Analyzing an amplifier - Graphical method - Equivalent circuit method - Gain of a multistage amplifier - RC coupled amplifier - Transformer coupling - Direct coupled amplifier - Comparison - Frequency response curve of an RC coupled amplifier - Classification of power amplifiers.

UNIT V: FET and UJT Characteristics**(15 Hours)**

FET - Junction Field Effect Transistor - Working principles of JFET - Characteristics - Advantages - The MOS field effect transistor - Circuit characteristics of the FET - Types of MOSFET - UJT - Construction - Operation - Equivalent circuit - Characteristics - UJT as relaxation oscillator - Over voltage detector.

TEXT BOOKS:

1. V.K.Mehta - Principles of Electronics, S. Chand & Co Reprints 2010.
2. Bhargava N.N, Kulshreshtha D.C and S.C Gupta - Basic Electronics and Linear Circuits, Tata McGraw Hill Publishing Company Limited, 2007.
3. Milmann and Halkias - Integrated Electronics, Tata McGraw Hill - 43rd reprint 2007.

REFERENCE BOOKS:

1. John D. Ryder - Electronics Fundamentals and Applications, PHI 5th Edition 1999.
2. Albert Paul Malvino - Electronic Principles, Tata McGraw Hill - 6th Edition.
3. N.N.Bhargava, D. Kulshreshtha & G. Gupta - Basic Electronics and Linear Circuits, Tata McGraw Hill.

PRACTICAL – ELECTRONICS - I

COURSE CODE : 26 UPHC 55

SEMESTER - V CORE - P5 HOURS - 2 CREDITS - 2 TOTAL HOURS : 30

1. Transistor Characteristics - CE Configuration.
2. Transistor Characteristics - CB Configuration.
3. Clipping Circuits.
4. Differentiator and Integrator.
5. Construction of Bridge Rectifier.
6. FET Characteristics.
7. UJT Characteristics.
8. Construction of Full wave Rectifier.
9. SCR - Characteristics.
10. UJT Relaxation Oscillator.

QUANTUM MECHANICS AND RELATIVITY
(COURSE CODE: 26 UPHC 52)

SEMESTER - V CORE - T6 HOURS - 5 CREDITS - 3 TOTAL HOURS : 75

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

CO1 : understand the postulates of quantum mechanics and capable of solving one dimensional transmission and reflection problems.

CO2 : understand de-broglie wavelength and the matter waves.

CO3 : solve schrodinger time dependent and time independent equations

CO4 : solve the various problems pertaining to hydrogen atom and rigid rotor

CO5 : understand the differences between general and special theory of relativity.

UNIT - I Matter Waves (15 Hours)

The de Broglie wavelength - G.P. Thompson's experiment - expression for group velocity - relation between group velocity and wave velocity - Experimental study of matter waves - Davisson and Germer's experiment - Compton effect.

UNIT - II Uncertainty Principle (15Hours)

Heisenberg's uncertainty principle - Determination of position with X - ray microscope - Diffraction of a beam of electrons by a slit - Complementary principle of Bohr - wave mechanical atom model - the particle in a box - Mathematical proof of uncertainty principle for one dimensional wave-packet - basic postulates of quantum mechanics.

UNIT - III Schrodinger Equations and their Applications (15 Hours)

Schrodinger time - dependent equation - Schrodinger time - independent (steady state) equation - Properties of the wave function - particle in a one - dimensional box - Potential step - the barrier penetration problem - Linear harmonic oscillator - the hydrogen atom - the rigid rotator.

UNIT - IV Relativity (15 Hours)

Relativity - Frame of reference - Galilean transformation equations - Michelson-Morley experiment - postulates of special theory of relativity - the Lorentz transformation equations - length contraction - time-dilation - the twin paradox - Relativity of simultaneity.

UNIT - V Mass, Energy and General Theory of Relativity (15 Hours)

Addition of velocities - variation of mass with velocity - mass energy equivalence - Minkowski's

four dimensional space - time continuum - the general theory of relativity.

TEXT BOOKS:

1. R. Murugesan and Kirthuthiga Sivaprakash - Modern Physics, Chand & company, 12th Revised Edition, 2005.
2. Mathews and Venkatesan, 1976, A Text book of Quantum Mechanics McGraw - Hill Higher Education.

REFERENCE BOOKS:

1. S. P. Singh and M. K. Bagde - Quantum Mechanics, S. Chand & Co., Edition 1998-1999.
2. Kumar and Sharma - Quantum Mechanics, Jai Prakash Nath & Co., 5th Edition 2000.
3. Seighal and Chopra - Quantum Mechanics, Seeman Pathipagam, Edition 2000.
4. Arthur Beiser - Quantum Mechanics, Tata McGraw Hill, Edition 2010.
5. A. K. Saxena - Quantum Mechanics, Narosa Publishing House, 2002.
6. D. S. Mathur - Mechanics, S. Chand & Co., Edition 2009.

DIGITAL PRINCIPLES
(COURSE CODE: 26 UPHC53)

SEMESTER - V CORE - T7 HOURS - 4 CREDITS - 3 TOTAL HOURS : 60

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

CO1 : understand the basic tool for the design of digital circuits and the hardware side of computers.

CO2 : understand the basic concepts in arithmetic circuits.

CO3 : understand the difference between half subtractor and full subtractor.

CO4 : understand the various functions of flip flops and registers.

CO5 : understand the functions of registers and counters.

UNIT – I Arithmetic Circuits (12 Hours)

Binary, Octal and Hexadecimal number system - Boolean algebra - Verification of Boolean relations - Sum of Product circuits - Product of Sum circuits - Karnaugh Map simplification - Binary addition - Binary subtraction - 1's & 2's Complement representation - Arithmetic operations - Half adder - Full adder - Half subtractor - Full subtractor, Logic gates.

UNIT – II Data Processing Circuits (12 Hours)

16 to 1 Multiplexer - 1 to 16 Demultiplexer - 1 of 16 Decoder - BCD to Decimal Decoder - Seven Segment Display - Encoder - Decimal to BCD Encoder - Parity Checker - Parity Generator - ROM using Diodes - PAL.

UNIT – III Flip Flops (12 Hours)

555 Timer - Astable and Monostable Multivibrators - Flip flop - RS Flip flop - Clocked RS Flip flop - JK Flip flop - JK Master Slave Flip flop.

UNIT – IV Registers and Counters (12 Hours)

Registers - Universal gates - Types of Registers - Serial in Serial out Shift Register - Parallel in Parallel out Shift Register - Counters - Asynchronous Counter (4 bit up - down) - Synchronous Counter (4 bit up - down) - BCD Ripple Counter.

UNIT – V Digital to Analog Conversion**(12 Hours)**

Introduction - Resistor Divider D/A Counter - Binary Ladder Network D/A Converter - D/A Converter Specifications - Analog to Digital Conversion - A/D Counter - Simultaneous Conversion - Counter Method.

TEXT BOOK:

Donald P. Leach, Albert Paul Malvino, Goutam Saha - Digital Principles and Applications, Tata McGraw - Hill, 6th Edition.

BOOKS FOR REFERENCE:

1. Mono Morris - Digital Logic and Computer Design, Prentice Hall, 2000.
2. Virendrakumar - Digital Electronics, New Age International, 2002.
3. Thomas C. Bartee - Digital Computer Fundamentals, Tata McGraw - Hill, 2002.

DIGITAL PRINCIPLES (PRACTICALS)
(COURSE CODE: 26 UPHC 56)

SEMESTER - V CORE - P6 HOURS - 2 CREDITS - 2 TOTAL HOURS : 30

1. Boolean Relations.
2. Flip-flops.
3. Gates (IC) - Verification of Truth tables.
4. De Morgan's Theorem - Verification.
5. Half Adder and Half Subtractor.
6. Full Adder and Full Subtractor.
7. 16 to 1 Multiplexer.
8. 1 to 16 Demultiplexer.
9. BCD to Decimal Decoder.
10. Decimal to BCD Encoder.

NUCLEAR PHYSICS
(COURSE CODE: 26 UPHC 54)

SEMESTER - V CORE – T8 HOURS – 4 CREDITS – 3 TOTAL HOURS : 60

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

CO1 : learn the basic concepts of physics of the nucleus, nuclear models and nuclear force.

CO2 : phrase a chronology of some of the major events in nuclear physics.

CO3 : distinguish between principles and working of different types of particles detectors, counters and accelerators.

CO4 : analyses the various nuclear reaction and application of nuclear fission and fusion.

CO5 : keep up with latest developments and new applications in nuclear physics.

CO6 : recognize the connection between nuclear physics and other branches of physics.

UNIT - I Introduction to the Nucleus

(12 Hours)

Introduction – classification of nuclei – general properties of nucleus– nuclear density – nuclear charge – spin angular momentum – resultant angular momentum – nuclear magnetic dipole moment – binding energy – packing fraction – nuclear stability – theories of nuclear composition – non-existence of electron within the nucleus – nuclear forces – meson theory of nuclear forces – liquid drop model – Weizacker's semi-empirical mass formula - shell model.

Unit – II Radiation Detectors & Radioactivity

(12 Hours)

Introduction – Interaction between energetic particles and matter – Ionization chamber – Proportional counter – Wilson cloud chamber – Linear Accelerator – Cyclotron – Betatron – Discovery of Radioactivity – Natural Radio activity - α rays – spectra - Gamow's theory of α decay – β rays – spectra - Neutrino theory of β decay - Origin of γ rays – Nuclear isomerism – Mossbauer effect – Soddy-Fajan's Law – Law of radioactive disintegration - Half life – Mean Life – Radioactive dating : Age of the earth – Biological effects of nuclear radiation.

UNIT - III Nuclear Reactions

(12 Hours)

Types of nuclear reactions - Q-value equation – Artificial radioactivity – Applications of radio isotopes – Neutrons – Discovery – Basic properties – Classifications – neutron sources – Nuclear fission – Energy released in fission – Atom Bomb – nuclear fusion – thermo-nuclear reactions – Hydrogen Bomb – Slow neutron reactions - Nuclear reaction cross section – Compound nucleus formation – Thermal neutrons –

Diffusion equation – Fast neutron diffusion –Fermi Age equation.

UNIT - IV Nuclear Reactors

(12 Hours)

Introduction –Chain reaction - Multiplication factor – Neutron leakage and critical size – Nuclear reactors –classification –Pressurized water reactor –Boiling water reactor –Fast breeder reactor – Fusion Reactors – Reactor control – reactor shielding – Research reactors – control of reactors – Principle – Methods – Source of control – Types of control rods – Fuel depletion – Reactor fuels –Sources of Uranium – Production of reactor fuels – Reactor fuel cycle – Radioactive waste disposal.

UNIT - V Elementary Particles

(12 Hours)

Classification of elementary particles – fundamental interactions – strong interaction – electromagnetic interaction – weak interaction – gravitational interaction – elementary particle quantum numbers – baryon number – lepton number – strangeness number – hyper charge – isospin quantum number – conservation laws and symmetry – quark model – compositions of hadrons - coloured quarks and gluons – charm, bottom and top quarks - threegenerations of quarks and leptons.

TEXT BOOKS:

1. R. Murugesan and Kiruthiga Sivaprasath - Modern Physics, S.Chand & Company Pvt. Ltd., 17th Revised Edition 2014.
2. Mani H.S. and Mehta (G.K), Introduction to Modern Physics, Affiliated East West Press PVT Ltd.

REFERENCE BOOKS:

1. Goshal, S.N. - Nuclear Physics, S.Chand & Company Pvt. Ltd., Revised Enlarged Edition, 2014.
2. Tayal, D.C. - Nuclear Physics, Himalaya Publishing House, 4th Edition, 2000.
3. Irwing Kaplan - Nuclear Physics, Narosa Publishing House, Edition 2002.
4. Elankovan, K. - Nuclear Physics, MJP Publishers, 2012.

**PROGRAMMING WITH C and C++
(COURSE CODE: 26 UPHE 51)**

SEMESTER - V EC - T6 HOURS - 4 CREDITS - 3 TOTAL HOURS : 60

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

CO1 : know the programming principles of C and C++

CO2 : know the operators, expressions, and functions in C and C++

CO3 : understand the OOP concepts

CO4 : write programs to perform matrix addition sorting

CO5 : use classes and objects in C++ program

Unit - I : Introduction to C

(12 Hours)

Introduction to C - character set - constants - variables - data types - declaration of variables - arithmetic operators - relational operators - logical operators - assignment operators - increment and decrement operators - conditional operators - bitwise operators - special operators - arithmetic expressions - evaluation of expressions - procedure of arithmetic operators.

Unit - II : Looping and Arrays

(12 Hours)

Reading and writing a character - formatted input and output - simple of statement - if-else statement - nesting of if-else statements - the else-if ladder - Switch Case Block - Go To statement - While Loop - Do While Loop - for loop - jumping in loops - break and continue statement-one dimensional array - two dimensional array - initializing arrays - multidimensional arrays.

Unit - III : User Defined Functions

(12 Hours)

Need for user defined functions - return values and their types - no arguments and no return values - arguments but no return values - arguments with return values - need of pointers - need of structure - definition - structure initialization - arrays of structure - arrays within structures - structure within structure - Union - Definition

Unit - IV : OOP with C++ and Functions in C++**(12 Hours)**

OOP paradigm - Basic concepts of object oriented programming - object oriented languages - what is C++? - Applications of C++ - basic data types (3 types) - user defined data types - derived data types - operators - manipulators - operator overloading - operator precedence - Introductions to Functions - main function - function prototyping - call by reference - return by reference - inline functions - default arguments - constant arguments - function overloading.

Unit - V : Classes and Objects, Console I/O Operations**(12 Hours)**

C++ streams - C++ Stream classes - Unformatted I/O Operations - Formatted console I/O operations - Managing output with manipulators - Specifying a class - Defining member functions-A C++ program with class - Nesting of member functions - Arrays within a class - Arrays of objects.

TEXT BOOKS:

1. E. Balagurusamy - Programming in ANSI C, Tata McGraw Hill, 4th Edition, 2007.
2. E. Balagurusamy - Object oriented program with C++, Tata McGraw Hill, 2nd Edition, 2007.

REFERENCE BOOKS:

1. Graham Neill - Learning C++, Tata McGraw-Hill, 2000.
2. D. Ravichandran - Programming with C++, Tata McGraw-Hill, 2000.
3. R. Rajaram - Object Oriented Programming and C++, New Age, 1997.

PRACTICALS - (PROGRAMMING WITH C AND C++)
(COURSE CODE: 26 UPHE 52)

SEMESTER - V EC – P5 HOURS – 2 CREDITS – 2 TOTAL HOURS : 30

1. To find the variance and standard deviation.
2. Evaluate $\sin x$ with .0001 accuracy.
3. Matrix addition.
4. Arrange the numbers in ascending order
5. Simple interest and compound interest
6. A program with arrays within a class.
7. To find the largest of N numbers
8. A program to manage console I/O operation.
9. Matrix multiplication.
10. Complex numbers manipulation

SOLID STATE PHYSICS
(COURSE CODE : 26 UPHC 61)

SEMESTER - VI CORE – T9 HOURS – 4 CREDITS – 3 TOTAL HOURS : 60

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

CO1 : Remember the different bonding and structures of solid materials.

CO2 : Understand the types of crystal systems based on lattice parameters identified using diffraction.

CO3 : Distinguish materials based on electrical conductivity, arrangement of atoms/molecules, etc.,

CO4 : Do quantitative calculations based on established theoretical models to describe the properties of materials.

CO5 : Distinguish between different types of magnetic materials and different kind of magnetism manifested in materials.

CO6 : Account for the links between solid state physics and other fundamental branches of physics.

UNIT - I Bonding in Solids

(12 Hours)

Interatomic forces - bonding - primary bonds - ionic bond - cohesive energy of ionic crystals - covalent bond - metallic bond - secondary bonds - molecular bond - Vanderwaals bond - hydrogen bond - dipole bond.

UNIT - II Crystallography

(12 Hours)

Lattice points, space lattice, basis and crystal structure - unit cell and primitive cell - lattice parameters - Bravice lattices and crystal systems - lattice planes and Miller indices - inter planar spacing - packing fraction - simple cubic structure, body centered cubic structure, face centered cubic structure, hexagonal close packed structure, diamond structure, Zinc Blende structure, Sodium chloride structure, Cesium chloride structure.

UNIT - III Semiconductors

(12 Hours)

Types of semiconductors - intrinsic and extrinsic semiconductors - Fermi level in intrinsic and extrinsic semiconductors - variation of Fermi level with temperature - carrier concentration in intrinsic semiconductors - carrier concentration in n-type and p-type semiconductors - band gap - direct and indirect band gap semiconductors - Hall effect -

semiconducting materials.

UNIT - IV Dielectrics

(12 Hours)

Fundamental definitions - dielectric constant - polarizability - polarization - electronic polarization - ionic polarisation - orientational polarisation - space-charge polarization - frequency and temperature effects on polarization – local field or internal field - Clausius-Mossotti relation - applications of dielectric/insulating materials - solid dielectric materials – liquid dielectric materials.

UNIT - V Superconductors

(12 Hours)

Superconductivity - properties of superconductors - Meissner effect - effect of magnetic field - heat capacity - critical current - isotope effect - London penetration depth - type I and type II superconductors - BCS theory - applications - magnetic levitation - SQUID - AC and DC Josephson effect (qualitative explanation) - superconducting materials.

TEXT BOOKS:

1. M. Arumugam - Solid State Physics, Anuradha Publications, 2nd Edition 2009, (Units I-IV).
2. S.O.Pillai - Solid State Physics, New Age International Publishers, 60th Edition 2008, (Unit V).

REFERENCE BOOKS:

1. K. Elangovan - Solid State Physics, MJP Publishers, 2013.
2. Arun Kumar - Solid State Physics, PHI Learning Pvt. Ltd., 2010.
3. M.A.Wahab - Solid State Physics, Narosa Publishing House, 2nd Edition, 2010.
4. R.K.Puri and V.K.Babbar – Solid State Physics, S.Chand & Company Ltd., 2004.

SEMESTER - VI CORE - T10 HOURS - 4 CREDITS - 3 TOTAL HOURS : 60

CO1 : understand the basic concepts of nano particles and crystal.

CO2 : understand the properties of measuring the properties.

CO3 : understand the various functions of transmission.

CO4 : know more about the scanning electron microscope.

CO5 : understand the various carbon nanostructures.

CO6 : understand the effects of nanotechnology and its environment.

Introduction - Atomic structure - Crystallography - Insulators, Semiconductors and Conductors - Donors, Acceptors and Deep traps - Mobility - Excitons - Reciprocal space - Fermi surfaces.

Techniques (12 Hours)

Introduction - Metal Nanoclusters - Magic numbers - Theoretical modeling of Nanoparticles - Geometric structure - Electronic structure - bulk to Nano transition - particle size determination - Transmission Electron Microscopy - Field Ion Microscopy - Scanning Electron Microscope - Dynamic light scattering - Infrared surface spectroscopy - Raman spectroscopy - Photoluminescence.

Semiconducting Nanoparticles - Optical properties - Methods of synthesis - RF plasma - Chemical methods - Thermolysis - Pulsed laser methods.

Introduction - Carbon clusters - Small carbon clusters - Discovery of C₆₀ - Superconductivity in C₆₀ - Larger and smaller fullerenes - Carbon nanotubes - Fabrication - Structure - Electrical properties - Vibrational properties - Mechanical properties - Applications of carbon

SEMESTER - VI CORE - T11 HOURS - 4 CREDITS - 2 TOTAL HOURS : 60

CO1 : attain a sound understanding of the principles of electronics.

CO3 : learn the different electric parameters and units used and also the different types of power amplifiers.

CO5 : understand the functions of operational amplifiers.

CO6 : learn the construction and working of oscillators.

Feed back in amplifiers - gain with negative feedback - gain stability by negative feedback - reduction of non linear distortion - effect of feedback on output resistance - effect of feedback on input resistance - voltage series feedback(emitter follower) - current series feedback - differential amplifier - differential mode gain - common mode gain-CMRR.

Op.amp - ideal characteristics - op.amp as inverting amplifier - virtual ground - non inverting amplifiers - input offset voltage - input offset current - slew rate - op.amps sign changer - scale changer - averaging amplifier – subtractor - differentiator-integrator - comparator - logarithmic amplifier - solving differential equations

Oscillators - barkhausen criterion for oscillation - positive feedback amplifier as an oscillator - Tuned collector oscillator - Hartley oscillator - Colpitt's oscillator - RC phase shift oscillator - piezo electric effect - piezo electric crystals - crystal oscillator.

SCR- working of SCR - equivalent circuit of SCR- important terms - V-I characteristics of SCR - SCR in normal operation - SCR as a switch - SCR turn on methods - SCR as half wave rectifier - SCR as full wave rectifier - SCR as over light detector - SCR for power control.

Unit - V Modulation**(12 Hours)**

Types of modulation - need for modulation - expression for power in AM wave -transistor AM modulator balanced modulator - limitations of AM modulation -frequency modulation - expression for frequency modulated wave – advantages - FM transmitter – demodulation - diode detector.

TEXT BOOKS:

1. V.K.Mehta - Principles of electronics, S. Chand & Co Reprints 2010.
2. Bhargava N.N, Kulshreshtha D.C and S.C Gupta - Basic electronics and linear circuits, Tata McGraw Hill Publishing Company Limited, 2007.
3. Milmann and Halkias – integrated electronics, Tata McGraw Hill - 43rd reprint 2007.

REFERENCE BOOKS:

1. John D. Ryder - Electronics fundamentals and applications, PHI 5th Edition, 1999.
2. Albert Paul Malvino - Electronic principles, Tata McGraw Hill - 6th Edition.
3. N.N.Bhargava, D. Kulshreshtha & G. Gupta - Basic electronics and linear circuits, Tata McGraw Hill.

ELECTRONICS - II (PRACTICALS)
(COURSE CODE: 26 UPHC 64)

SEMESTER - VI CORE - P7 HOURS - 2 CREDITS - 2 TOTAL HOURS : 30

1. Single stage amplifier without feedback.
2. Two stage amplifier.
3. Emitter follower.
4. Single stage amplifier with feedback.
5. Colpit's oscillator.
6. Hartley oscillator.
7. Op-amp - characteristics
8. Solving simultaneous equation.
9. A/D converter using Op-amp.
10. Op-amp - adder, subtractor, unit gain buffer.

INSTRUMENTATION (PRACTICALS)

(COURSE CODE: 26 UPHC 65)

SEMESTER - VI CORE - P8 HOURS - 2 CREDITS - 2 TOTAL HOURS : 30

1. Calculation of standard deviation and variance and probable error.
2. Plotting of histogram of a physical quantity.
3. Construction of a multi range dc voltmeter.
4. Construction of series - type ohm meter
5. Construction of shunt - type ohm meter.
6. Calibration of dc ammeter/dc voltmeter
7. Full wave rectifier as ac voltmeter
8. Photo electric Transducer
9. Measurement of voltage & frequency by CRO

MICROPROCESSOR - 8085
(COURSE CODE: 26 UPHE 61)

SEMESTER - VI EC – T7 HOURS – 4 CREDITS – 3 TOTAL HOURS : 60

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

CO1 : understand the microprocessor hardware and software.

CO2 : write programs using assembly language.

CO3 : know the purpose of microprocessor internal registers.

CO4 : demonstrate a thorough understanding of programming, implementing programs that search and sort arrays.

CO5 : know the terms applicable to microprocessor, program using Assembly Level Language.

CO6 : understand the different types of interrupts.

Unit - I: 8085 Microprocessor Architecture (12 Hours)

Microprocessors - Microprocessor Instructions Set and Computer Languages - Microprocessor architecture and its operations - Memory - I/O devices - Examples.

Unit - I: Programming the 8085 (12 Hours)

Programming the 8085 - Data Transfer operations - Arithmetic operations - Logic operations - Branch operations - Writing assembly language programs - Programming techniques; Looping counting and indexing - Additional data transfer and 16 bit arithmetic instructions - arithmetic operations related to memory - Rotate - Compare.

Unit - III: Stack and Subroutines (12 Hours)

Counters and Time delays - Stack - PUSH and POP instructions - Subroutine - CALL and RETURN instructions - Restart, Conditional CALL and RETURN instructions.

Unit - IV: Code Conversion (12 Hours)

BCD to binary conversion - binary to BCD conversion - BCD addition - BCD subtraction - multiplication - Subtraction with carry - Sorting - Transfer a block of data - Transfer a block of data in reverse order.

Unit - V: Interrupts**(12 Hours)**

Interrupts - The 8085 interrupt - INTR , INTA & RST instruction - Illustration of 8085 interrupt - Issues in implementing interrupts - multiple interrupts and priorities - 8085 vector interrupts - TRAP - RST 7.5, 6.5 and 5.5 - I n t e r f a c i n g - Digital clock design - Traffic Signal Display.

TEXT BOOK:

1. Ramesh S. Gaonkar - Microprocessor Architecture, Programming and Applications with the 8085., Penram International Publishing (India) Private Ltd, 5th Edition.

REFERENCE BOOKS:

1. Leventhal, Lance A, 8080A/8085 - Assembly Language Programming, Osbrne McGraw -Hill, 2000.
2. Sunil MATHur, Microprocessor 8085 and its interfacing, PHI, 2010.
3. Udaya Kumar.k, Umasankar. B.S., The 8085 Microprocessor Architecture, Pearson Education, 2008.

MICROPROCESSOR - 8085 (PRACTICALS)
(COURSE CODE: 26 UPHE 62)

SEMESTER - VI EC – P6 HOURS – 2 CREDITS – 2 TOTAL HOURS : 30

ANY TEN EXPERIMENTS :

1. 8-bit addition and 8-bit subtraction
2. Unpacking of packed 8 bit number
3. Multiplication of two 8 bit numbers
4. Division of 8 bit number
5. Addition of N numbers
6. Multibyte Addition & Subtraction
7. Transfer a block of data
8. Transfer a block of data in reverse order
9. Largest of given N numbers
10. Smallest of given N numbers
11. Arranging numbers in a Ascending order
12. Arranging numbers in Descending order
13. Binary to BCD conversion
14. BCD to Binary conversion
15. Generating square wave / Triangular wave
16. Traffic signal display
17. Name display

**PHYSICS FOR COMPETITIVE EXAMS
(PROFESSIONAL COMPETENCY SKILL)
(COURSE CODE : 26 UPHS 61)**

SEMESTER - VI SEC - 6 HOURS - 2 CREDIT – 2 TOTAL HOURS : 30

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

CO1 : refresh their knowledge of fundamentals of physics.

CO2 : prepare them for entrance examinations.

CO3 : revise the subjects quickly at the time of examinations.

CO4 : understand the subject from the elementary level to the required standard level in a simple language.

CO5 : understand the various laws of motion.

CO6 : understand the reflection and refraction of light.

UNIT – I : Mechanics

(6 Hours)

Laws of motion - force - momentum - work - energy - circular motion - simple harmonic motion - rigid body rotation - gravitation - Equation of continuity - Bernoulli's principle and applications - velocity of sound.

UNIT – II: Elasticity and Thermodynamics

(6 Hours)

Hooke's law - stress, strain - elastic modulus - viscosity - Surface tension - capillary rise of liquids - Osmosis - Diffusion - Carnot cycle - Specific heat of liquids and gases - liquefaction of gases - Conduction - Convection and radiation - Black body radiation.

UNIT – III: Optics

(6 Hours)

Reflection of plane surface - Refraction at plane surface and through a prism. defects in images - Interference - Newton's rings, critical angle, optical fibres, Lasers, polarization.

UNIT – IV: Electricity

(6 Hours)

Electric potential - Ohm's law - resistor - capacitor - galvanometer - Magnetic elements – electromagnetic induction.

UNIT – V : Atomic physics and Electronics

(6 Hours)

Classification of nuclei, properties of nuclei - nuclear radiations - photoelectric effect - chain

reaction - nuclear fission and fusion - atom bomb and hydrogen bomb - nuclear reactor - elementary particles - Diode - transistor - logic gates.

BOOKS FOR REFERENCE:

1. N. K. Nayyar – Unique Quintessence of Physics (Ed) for M.Sc.Entrance Examinations, Unique Publishers, New Delhi, 2009.
2. N. K. Nayyar – Unique Quintessence of Physics (Ed) for UPSC /State Civil Services and other Competitive Examinations, Unique Publishers, New Delhi, 2009.
3. M.T. Dharmadhikari, A.Y. Waghale, Vidyadhar Kande-Patil, Himalaya Publishing House, Mumbai, 2006.

EXTRA CREDIT COURSE -1
INTRODUCTION TO SOLAR ENERGY
(COURSE CODE : 26 UPH EC1)

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

- CO1: outline the technologies used to harness the power of Solar Energy.
- CO2: get knowledge of the instruments to measure the solar energy.
- CO3: know the reason why energy sources are effective to commercial, residential and industrial markets.
- CO4: explain the principles that underlies the ability of various natural phenomena to deliver solar energy.
- CO5: To understand the advantages and disadvantages of solar energy.

Unit - I

Physics of the sun - solar energy - nuclear fission and nuclear fusion - advantages and disadvantages of solar energy.

Unit - II

Black body radiation - solar spectrum - electromagnetic spectrum - conduction - convection - radiation - basic laws of radiation - solar constant - green house effect.

Unit - III

Solar radiation on the earth's surface - terrestrial radiation - beam , diffuse and global radiation - Measurement of solar radiation - pyranometer - pyrliometer - sunshine recorder.

Unit - IV

Semiconductors - n-type and p - type semiconductors - photon interactions with semiconductors - PV cells.

Unit - V

Applications of solar energy - solar cells - solar cooker - solar dryer - solar water heating systems - solar air heating and air-conditioning systems.

TEXTBOOK:

1. G.D.Rai, Solar Energy Utilisation, Khanna Publishers, 5th Edition 2009.

BOOKS FOR REFERENCE:

1. Solar Energy Principles of Thermal Collection and Storage - S.P.Sukhatme , Tata McGraw Hill Publishing Company Ltd., 2nd Edition (1997).
2. Non-Conventional Energy Sources – G.D. Rai, Khanna Publishers – 4th Edition (2008).

EXTRA CREDIT COURSE -2
OPTO ELECTRONICS
(COURSE CODE : 26 UPH EC2)
CREDITS - 2

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

CO1 : give an introductory account of the basic principles of opto-electronic devices.

CO2 : understand the principle and working of LASER.

CO3 : gain information about fiber optic communication.

CO4 : provide knowledge about semiconducting materials.

CO5 : understand the importance of optical fiber in communication.

Unit 1:

Introduction - PN junction as a Light Source (LED) - LED materials Advantages - LCD Characteristics and action of LCD - Advantages.

Unit 2:

Laser - Introduction - characteristics of Laser - Spontaneous and stimulated emission - Einstein coefficients - condition for population inversion - three level scheme - semi conductor.

Unit 3:

Photo detector - characteristics of photo detectors - PN junction photo detector - PIN photo diode - Avalanche photo diode - Photo transistor.

Unit 4:

Introduction principle of optical fiber - light transmission in a optical fiber - Acceptance angle - Numerical aperture.

Unit 5:

Fiber index profiles - Step index, graded fiber (transmission of signals) Advantages of fiber optic communications, optical switching - Logic gates.

TEXT BOOKS:

1. Semiconductor Physics and Optoelectronics - P. K. Palanisamy, SCITECH Publication, Chennai 2002.

2. Optical fibers and Fiber Optic Communication - Sabir Kumar Sarkar IV Revised Edition 2003.

REFERENCE BOOK:

1. Opto Electronics - Wilson & Hawker, Prentice Hall of India 2004.

EXTRA CREDIT COURSE -3
NON-CONVENTIONAL ENERGY SOURCES
(COURSE CODE : 26 UPH EC3)

CREDITS - 2

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

CO1 : get knowledge about the Sun as a source of energy.

CO2 : study about solar thermal and photovoltaic devices.

CO3 : understand the basic concepts of Wind and Bio-mass.

CO4 : learn about the geothermal energy sources.

CO4 : identify the various forms of energy utilization concepts.

CO5 : analyse the advantages and disadvantages of various forms of energy.

Unit - I ENERGY SOURCES

Energy sources and their availability - fossil fuels - water power - nuclear energy - non-conventional and renewable energy sources - advantages of renewable energy.

Unit - II SOLAR ENERGY

Introduction - solar constant - solar radiation at the earth's surface - beam and diffuse solar radiation - physical principles of the conversion of solar radiation into heat - solar pond - photo voltaic principles - PV Cell - applications of solar energy.

Unit - III WIND ENERGY

Introduction - power in the wind - basic components of wind energy conversion - classification of wind energy conversion systems(WECS) - advantages and disadvantages of WECS - applications of wind energy.

Unit - IV GEOTHERMAL ENERGY

Introduction - geothermal sources - hydrothermal(convective resources) - geopressured resources - advantages and disadvantages of geothermal energy over other energy forms - applications of geothermal energy.

Unit - V BIOMASS AND TIDAL ENERGY

Introduction - biomass conversion technologies - photosynthesis - biogas generation - factors affecting biodigestion on generation of gas - biogas plants - Tidal energy - Basic principle of tidal power - advantages and limitations of tidal power generation - Wave - energy conversion

devices - Advantages and disadvantages of wave energy.

BOOK FOR STUDY:

2. Non-Conventional energy sources – G.D. Rai, Khanna Publishers – Fourth Edition (2008).

BOOKS FOR REFERENCE:

1. Solar energy utilization - G.D.Rai, Khanna Publishers, Fifth edition (2009).
2. Solar energy principles of thermal collection and storage - S.P.Sukhatme , Tata McGraw HillPublishing company Ltd., Second edition (1997).

EXTRA CREDIT COURSE - 4
LASER PHYSICS
(COURSE CODE : 26 UPH EC4)
CREDITS - 2

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

CO1 : study the principle of lasers.

CO2 : understand the different type of laser systems.

CO3 : know about the dynamics of laser systems.

CO4 : analyse the various types of laser effects.

CO5 : get knowledge about the various applications of lasers.

UNIT - I BASIC PRINCIPLES OF LASER

Population Inversion - Laser Pumping - A two level system - A three level system – Resonators - vibrational modes of a resonator - No. of modes per unit volume - Open resonators - The confocal resonator - The quality factor Q - The threshold condition - Quantum yield.

UNIT - II SPECIFIC LASER SYSTEMS

Solid state lasers: The Ruby laser - Nd-yag laser - Semiconductor lasers: intrinsic semiconductor lasers - doped semiconductors - condition for laser action - Liquid dye and chemical lasers: liquid lasers- dye lasers - HCL laser - Brommi laser.

UNIT - III DYNAMICS OF THE LASER PROCESSES

Q-Switching - Mechanical shutter - Electro chemical shutters - shutters using saturable dyes - Peak power emitted during the pulse - Giant pulse dynamics - Laser amplifiers - Mode locking – Mode pulling - Hole burning.

UNIT - IV LASER SPECTROSCOPY

Rayleigh and Raman spectroscopy - Stimulated Raman effect - Coherent Anti stokes Raman scattering (CARS) - Photo Acoustic Raman Spectroscopy - Doppler free two photon Spectroscopy - Brillouin Scattering.

UNIT - V APPLICATIONS OF LASERS

Industrial Applications - hole drilling-cutting - laser welding - Science and Technology - lasers in nuclear science - counting of atoms - Light Detection and Ranging (LIDAR) - Measurement of velocity- Lasers for inspection of products - Holography.

TEXT BOOKS :

1. Laud.B.B, 2011, Lasers and Non-Linear Optics, Third Edition, New Age International Publishers
2. Nambiar. K.R, 2005, LASERS Principles, Types and Applications, 1st Edition, New Age International Publishers.

REFERENCE BOOKS :

3. William T. Silvast. 1998, Laser Fundamentals, 1st Edition, Cambridge University Press.
4. Svelto.O, 2010, Principles of Lasers, 5th Edition, Springer.

EXTRA CREDIT COURSE -5
ASTROPHYSICS
(COURSE CODE : 26 UPH EC5)

CREDITS - 2

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

- CO1. know about the universe and space technology.
- CO2. understand the concepts of astronomy.
- CO3. know the functions of telescopes in weather and their applications.
- CO4. analyse the physical properties of sun and its behavior.
- CO5. correlate the concepts and relations.

UNIT - I

Birth of Modern Astronomy – Geocentric and Heliocentric theories – Kepler’s laws of planetary motion - Planets – Terrestrial and Jovian planets – Asteroids - Meteorites – Comets.

UNIT – II

Telescopes – Elements of telescope – Properties of images – Types of Optical telescopes – Refracting and Reflecting telescopes - Radio telescope Spectrograph.

UNIT - III

Sun – Physical properties – Composition – Core – Nuclear Reactions – Photosphere – Chromosphere – Corona – Sunspots – Sunspot cycle – Solar Wind – Auroras .

UNIT - IV

Classification of Stars – The Harvard Classification system – Luminosity of a Star –Theoretical evolution of stars – White Dwarfs – Neutron stars - Black holes.

UNIT - V

Galaxy nomenclature – Types of Galaxies – Spiral – Elliptical – Irregular galaxies – Milky Way Galaxy and its structure –Star clusters – Galactic clusters.

BOOKS FOR STUDY:

1. Nicololas. A. Pananides and Thomas Arny, 1979, Introductory Astronomy, Addison Wesley Publ. Co.

2. A. Mujiber Rahman, Concepts to Astrophysics, scitech Publications, Chennai.

REFERENCE BOOKS:

1. Abell, Morrison and Wolf, 1987, Exploration of the Universe, 5th Edn., Saunders College Publ.
2. Carol and Ostlie, 2007, Introduction to Modern Astrophysics, 2nd Edn., Pearson International.
3. William J. Kaufmann, III, 1977, Macmillan Publishing company, London.
4. Abhyankar, K.D., Universities Press.

EXTRA CREDIT COURSE - 6
Applied Machine Learning
(COURSE CODE : 26 UPHE C6)
CREDITS - 2

Course Outcomes: At the end of the course the students must be able to

CO1 Learn the fundamentals of ML engineering lifecycle and build solutions using low-code AI tools and pre-built APIs (K1).

CO2 Understand data preprocessing, feature engineering, and governance strategies for large-scale ML datasets (K2).

CO3 Apply appropriate ML frameworks to develop and train models using cloud-based infrastructure (K3).

CO4 Analyze model performance and implement batch/online serving strategies for production deployment (K4).

CO5 Evaluate and monitor ML solutions using drift detection, security practices, and responsible AI principles (K5).

CO6 Design basic MLOps pipelines with automation and orchestration for continuous model updates (K6).

UNIT I: INTRODUCTION TO ML ENGINEERING & LOW-CODE AI

ML lifecycle and the role of an ML Engineer – Overview of Google Cloud ML ecosystem – Building models using BigQuery ML (classification, regression) – Leveraging pre-built APIs (Vision, Natural Language) – Training custom models using AutoML for tabular and image data – Introduction to responsible AI and fairness.

UNIT II: DATA PREPARATION & GOVERNANCE

Exploring and preprocessing data from Cloud Storage and BigQuery – Feature engineering and transformation techniques – Handling large datasets using distributed processing – Data versioning, lineage, and quality assessment – Collaborative workflows and basic data governance for ML projects.

UNIT III: MODEL TRAINING & EVALUATION

Choosing ML frameworks (TensorFlow, PyTorch, XGBoost) – Model architecture design and transfer learning – Training models on cloud with GPUs – Hyperparameter tuning – Model evaluation metrics and cross-validation – Introduction to model interpretability (explainable AI).

UNIT IV: MODEL DEPLOYMENT & MONITORING

Batch vs. online inference strategies – Serving models using Vertex AI and BigQuery ML – Model versioning and canary deployments – Performance optimization (latency, memory) – Monitoring for data drift and model drift – Implementing security and bias detection using responsible AI guidelines.

UNIT V: MLOPS FUNDAMENTALS

Introduction to MLOps and pipeline orchestration – Building end-to-end pipelines using Vertex AI Pipelines – Automating training, retraining, and deployment – CI/CD basics for ML – Data and model validation – Ensuring consistent preprocessing between training and serving.

BOOKS FOR STUDY

1. Vijay Janapa Reddi et al., *Machine Learning Systems*, Harvard University / MIT Press, 2025.

2. Mona Mona & Pratap Ramamurthy, *Official Google Cloud Certified Professional Machine Learning Engineer Study Guide*, Sybex (Wiley), 1st Edition, 2024.

BOOKS FOR REFERENCE

1. Christian Kästner, *Machine Learning in Production: From Models to Products*, MIT Press, 2025.
2. Andriy Burkov, *Machine Learning Engineering*, True Positive Inc., 2020.

Web Resources

1. <https://cloud.google.com/learn/certification/machine-learning-engineer>

VALUE ADDED COURSE - 1
BIOMEDICAL INSTRUMENTATION
(COURSE CODE : 26 UPH CC1)
CREDITS - 2

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

CO1 : understand the physics on the human body.

CO2 : know the fundamental concepts and functioning.

CO3 : study the applications of physiological devices.

CO4 : know the importance of clinical and operation theatre equipment.

CO5 : provide the knowledge of telemetry system.

CO6 : apply the modern technologies used in the biomedical instrumentation.

UNIT - I PHYSICS OF HUMAN BODY

Cell structure - muscular system - cardiovascular system - Forces in and on the body - Medical effects of gravitation forces - pressure in the body - BMR basal metabolic rate - BMI body mass index- neurons - action potentials - passive and active electrical properties

UNIT - II BIOELECTRIC SIGNAL RECORDING

Electrocardiography(ECG) - Electroencephalograph(EEG) - Electromyograph(EMG) - Electrooculogram (EOG)

UNIT – III PHYSIOLOGICAL ASSIST DEVICES

Cardiac pacemakers - Natural and artificial pacemakers - Defibrillator - Various types of oxygenators - Kidney machine - Hemodialysing units .

UNIT – IV BASIC MEDICAL INSTRUMENTS

Thermometer - Stethoscope - Sphygmomanometer - pH meters - Audiometer - Endoscopes - ventilators - Microwave diathermy techniques

UNIT - V ADVANCES IN BIOMEDICAL INSTRUMENTATION:

X-rays in medicine - Lasers in medicine - Endoscopes - Nuclear imaging techniques - Computer tomography - Ultrasonic imaging systems - Magnetic resonance imaging - angiography.

BOOKS FOR STUDY:

1. M. Arumugam, Biomedical Instrumentation, Anuradha Publishing Co., Kumbakonam, Tamilnadu, 2004.
2. Jacobson and Webster, Medicine and Clinical Engineering, Prentice Hall of India, New Delhi, 1979.

REFERENCE BOOKS:

1. R. S. Khandpur, Handbook of Biomedical Instrumentation, Tata McGraw Hill, New Delhi, 1990.
2. Richard Aston, Principles of Biomedical Instrumentation and measurement, Merrill Publishing Co., London, 1990.
3. Marvin D. Weiss, Biomedical instrumentation, Chilton Book Co., 1973.
4. Leslie Cromwell, Fred J. Weibell, Erich A. Pfeiffer, Biomedical Instrumentation and Measurements, Prentice-Hall, 1980.

VALUE ADDED COURSE - 2
BASIC ELECTRICAL AND ELECTRONICS CIRCUIT

COURSE CODE: 26 UPHCC2

CREDITS - 2

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

CO1 : understand the working of electronic devices

CO2 : apply these techniques in practical circuits.

CO3 : develop the skill in handling instruments.

CO4 : understand the various characteristics pertaining to diodes and its applications.

CO5 : understand the various biasing techniques.

UNIT - I ELECTRONIC COMPONENTS **(6 Hours)**

Introduction - Passive components - Transformer - Working principle - application - Active devices:

Diode - Transistor - Analog IC and Digital ICs - logic gates.

UNIT - II EQUIPMENTS FOR SERVICING **(6 Hours)**

Soldering Iron - Flux - lead - Zero defect soldering - Desoldering pump - soldering station - Basics of Multimeter - Measurement of current, voltage and resistance using multimeter - Checking transistors and diodes.

UNIT - III HEATING APPLIANCES **(6 Hours)**

Heater types - working principle - Heating Rod - Iron Box - Iron box with steamer - Microwave Ovens -

Disassembling and assembling procedure - Fault indicator - Testing and Troubleshooting methods.

UNIT – IV MOTORISED APPLIANCES **(6 Hours)**

Types of Motors - DC and AC motor - Fans - mixers - wet grinders - circuit connection - testing methods. Washing machine - Electrical connections - assembly - Electrical connection - Testing and Trouble shooting methods.

UNIT - V REFRIGERATION APPLIANCES **(6 Hours)**

Fridge - Electrical connection - Compressor - coolants - Automatic defrost circuits -Testing and

troubleshooting of refrigerators - Air coolers and Air conditioners - Mounting and fixing of Air Conditioners - testing and troubleshooting methods.

BOOKS FOR STUDY:

1. Eric Kleinert, Troubleshooting and Repairing major appliances, McGraw Hill Professional, 3rd Edition, 2012.
2. Sawhney A.K., “A course in Electrical and Electronic Measurements and Instrumentation”, Dhanpati Rai & Sons, 11th Edition, 1995.

ADD ON COURSE - 1
DOMESTIC ELECTRICAL WIRING
(COURSE CODE : 26 UPH AO1)
CREDITS - 2

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

CO1 : acquire necessary knowledge on performance of various energy meters, switches, protective devices.

CO2 : understand the working principle of electrical instruments.

CO3 : check the electrical connections and acquire skills/hand on experience and working knowledge with house-hold electrical appliances.

CO4 : train the students for Troubleshooting wiring faults.

CO5 : apply the basic practical knowledge and skills of the students on electrical circuit testing, repairing household electrical appliances.

UNIT - I Introduction to Electricity

Electric charge - voltage - Electric current - Ohm's law - electric potential – cell - Serial and Parallel circuit - AC and DC voltage and current - Transformer, Electricity generation, transmission and distribution: Power stations - Soldering wires - Multimeter Operations.

UNIT - II Electric Switches and Energy Meters

Various types of switches - Methods of fixing Single Phase and Three Phase Energy meters.

UNIT – III House Electrical Wiring

Various types of wires for house wiring - different types of electric meters and instruments - Types of Wiring - casing, capping - single pole single throw, single pole double throw, double pole single throw and double pole double throw switches - staircase switches - tube light - ceiling fan - water heater- iron box connections.

UNIT - IV Electricity Bill

Power rating of household appliances including air conditioners - PCs - laptops - printers etc. Definition

of “unit” used for consumption of electrical energy - two-part electricity tariff - calculation of electricity bill for domestic consumers.

UNIT - V Protective Devices and Security Procedure

Fuses and circuit breakers - MCB - Purpose and methods of Earthing - Reporting accidents - system failures - power failures - protection equipment - First aid requirement in case of electric shocks and other injuries.

BOOKS FOR STUDY :

1. A Text book of Electrical Technology, B.L. Theraja, S. Chand & Co.,
2. Domestic Appliances Servicing, K.P. Answer, Scholar Institute Publications.
3. Electricity and Magnetism, R. Murugesan.
4. ABC of electrical engineering A. K. Theraja.

REFERENCES :

1. Inspection by Bob. Entry of Electrical System. <http://www.inspectionsbybob.com/vocab-electrical/>
2. The Philippine Electrical Code. <http://dsf.edu.ph/wp-content/uploads/2017/04/Philippine-Electrical-Code.pdf>Arctoolbox. Electrical Power Systems in Buildings. <https://www.archtoolbox.com/materials-systems/electrical/electrical-power-systems.html>
3. OEM Panels. 3 Phase Power vs. Single Phase Power. <http://www.oempanels.com/what-does-single-and-three-phase-power-mean>
4. UK Power Networks. <http://www.ukpowernetworks.co.uk/internet/en/help-and-advice/need-help/single-three-phase-difference.html>
5. Electrical Technology. Earthing and Electrical Grounding Installation | A Complete Guide. <https://www.electricaltechnology.org/2015/05/earthing-and-electrical-grounding-types-of-earthing.html>

ADD ON COURSE - 2
PHYSICS FOR BEGINNERS
(COURSE CODE: 26 UPH A02)
CREDITS - 2

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

- CO1 : remember the basics of Physics in wide range of areas.
- CO2 : understand the basic physics concepts behind every day activities of human life and understand characteristics of solar radiation and solar energy devices.
- CO3 : apply innovative ideas in our routine works using basic physics principles
- CO4 : create the awareness of scientific principles to the non-science audience.
- CO5 : evaluate the merits and demerits of nuclear reactors and nuclear weapons.

UNIT – I : Energy, Forces and Motion

Energy, Energy and food, Energy stores, Energy transfers, Renewable energy sources, Non-renewable energy sources, Climate change. Force, Types of forces, Balanced and unbalanced forces, Resultant forces, Circular motion, centripetal force, Newton's second law – force, mass and acceleration, Momentum.

UNIT – II : Sound and Light Waves

Waves, Sound waves, Longitudinal and transverse waves, Wave equation, SONAR, Comparing Light and Sound waves, Reflection, Refraction and Interference, Refractive index, Light and Color

UNIT – III : Electricity and Magnetism

Current Electricity, Conductors and insulators, Measuring voltage, current and resistance, Series and parallel circuit rules, Direct and alternating current. Magnets, Magnetic fields, Electromagnets, Electromagnetic induction, Dynamos.

UNIT – IV : States of Matter and Atoms

States of matter, solids, liquids and gases, Changes of state, Heat expansion, Density, Specific heat capacity, Pressure, Volume and Temperature, Atomic Structure, Radioactive decay, Different types of radiations, Nuclear medicine, Fission and Fusion.

UNIT – V : Space

Structure of Earth, Inside the Earth, Seasons, Sun's path, Solar system, The Moon, Eclipses, Orbits, Shapes of orbits, Types of orbits, Galaxies.

BOOKS FOR STUDY :

1. Super Simple Physics - The ultimate bite size study guide, DK Smithsonian,
2. How Things Work: The Physics of Everyday Life by Louis A. Bloomfield, Wiley Publications, 5th Edition.
3. University Physics by F. W. Sears, M. Zemansky, R. A. Freedman, and H. D. Young, Pearson Education.
4. Fundamentals of Physics by D. Halliday, R. Resnick, J. Walker, John Wiley & Sons

**ALLIED PHYSICS - I (FOR MATHEMATICS)
(COURSE CODE : 26 UPHE11)**

SEMESTER - I EC - T1 HOURS - 4 CREDITS - 3 TOTAL HOURS : 90

OBJECTIVES :

To impart basic principles of Physics that which would be helpful for students who have taken programmes other than Physics.

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

- CO1 : know, various modulus involved in the materials, flow of liquids due to viscous forces.
- CO2 : study the various laws involved in heat transformation.
- CO3 : classify the various thermodynamic laws.
- CO4 : understand the concept of Entropy.
- CO5 : understand the phenomenon like interference and diffraction.
- CO6 : study the optical activity of liquids and its uses.

UNIT - I : Elasticity (12 Hours)

Elasticity - Bending of beams - Expression for bending moment - Uniform bending - Theory - Twisting couple on a cylindrical wire - Expression for a couple per unit twist - Work done - Torsional pendulum - Experiment to determine rigidity modulus of the wire using torsional pendulum - Acceleration due to gravity - Compound pendulum - Theory and experiment.

UNIT - II : Surface Tension (12 Hours)

Surface tension - Excess of pressure over curved surface - Drop weight method - Coefficient of viscosity and its dimension - Stokes formula for viscous drag - Experiment to determine the coefficient of a highly viscous liquid - Flow of a liquid through a uniform capillary tube - Method of dimensions - Poiseuilles method.

UNIT - III : Specific Heat Capacity (12 Hours)

Specific heat capacity - Calendar and Barnes continuous flow method - Variation of specific heat

capacity of solids with temperature - Variation of atomic heat of solids with temperature - Theory of specific heat - Einstein theory - Debye's theory.

UNIT- 4 : Thermal Conductivity

(12 Hours)

Lees disc experiment to determine the thermal conductivity of a bad conductor (cardboard only)
- Analogy between heat flow and electric current - Weidemann - Franz law - Newton's law of cooling - Experimental verification - Experiment to determine the specific heat capacity of a liquid - Concept of pressure, volume and temperature of a gas - Mean free path - Expression for mean free path, viscosity and thermal conductivity.

UNIT - 5: Conventional Energy

(12 Hours)

Conventional energy sources - coal, oil and natural gas - Energy released in a nuclear fission and fusion - Nuclear reactor - Non conventional energy sources - Wind energy - Tidal energy - Wave energy - Photo voltaic effect - Solar cell - Solar ponds.

TEXTBOOKS:

1. A.Ubald Raj & G. Jose Robin - Properties of Matter and Optics, Indira Publications, 1st Edition.
2. A.Ubald Raj & G. Jose Robin - Allied physics, vol.2 (Thermal Physics and Sound) Indira Publications, 1st Edition.

REFERENCE BOOKS:

1. N.Sundararajan, George Thomas, Syed Azeez - College Physics vol 1, United Publishers, 1st Edition.
2. A.Ubald Raj & G. Jose Robin - Oscillations, Properties of Matter and Energy Physics and Optics and Spectroscopy - Indira Publications, 1st Edition.
3. Brijlal - Heat and Thermodynamics and Statistical Physics, S.Chand & Company - 2010.
4. R.Murugesan - Properties of Matter S. Chand and Company – 2010.

ALLIED PHYSICS – 1 PRACTICAL (FOR MATHEMATICS)
(COURSE CODE : 26 UPHE12)

SEMESTER - I EC - P1 HOURS - 2 CREDITS - 2 TOTAL HOURS : 30

1. Young's modulus - Uniform bending - Telescope
2. Young's modulus - Non-uniform bending - Pin & Microscope
3. Coefficient of Viscosity - Constant pressure head method
4. Surface Tension - Drop weight method
5. Acceleration due to gravity - Compound pendulum
6. Conductivity of bad conductor - Lee's disc method
7. Newton's law of cooling - Verification
8. Specific heat capacity of a liquid - Newton's law of cooling
9. Torsional Pendulum - Determination of rigidity modulus

ALLIED PHYSICS – II (FOR MATHEMATICS)
(SUB CODE : 26 UPHE 21)

SEMESTER – II EC– T2 HOURS – 4 CREDITS – 3 TOTAL HOURS : 60

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

CO1 : make the learner understand the basic principles of electricity.

CO2 : understand the applications of optics in everyday life.

CO3 : inculcate the knowledge in electronics circuits.

CO4 : learn the basic concepts of relativity.

CO5 : understand the principles amplifiers and oscillators.

UNIT - I **(12 Hours)**

Coulomb's law – electric field – electric field due to a point charge – electric dipole – electric flux – Gauss law – applications – electric field due to a charged conducting sphere (point inside and outside) – uniformly charged cylinder (line charge) – electric potential – potential difference – relation connecting electric field and electric potential at a point – equipotential surface.

UNIT - II **(12 Hours)**

Self induction of a coil – calculation of self inductance of a long solenoid – alternating current – calculation of average value of alternating current – phase difference between current and voltage in alternating circuits with resistance only, capacitance only and inductance only – LR circuit – LCR series resonance circuit – LCR parallel resonance circuit.

UNIT - III **(12 Hours)**

Junction diode – biasing – pn diode equation – V-I characteristics – Zener diode – experiments – applications – voltage regulator using Zener diode – Junction transistor – voltage-divider biasing – transistor amplifier – CE configuration – feedback principle - Barkhausen criterion for oscillations – Colpitt's oscillator.

UNIT - IV **(12 Hours)**

Interference – air wedge – Newton's rings – diffraction – experiment to determine the wavelength of monochromatic light using plane transmission grating - polarization – double refraction – Nicol prism – production of plane, circularly, elliptically polarized light.

UNIT - V

(12Hours)

Frame of reference – Galilean transformation – Michelson and Morley experiment – special theory of relativity – Lorentz transformation equation – velocity transformation equations - relativistic velocity addition – length contraction – time dilation – variation of mass with velocity – Einstein's mass energy relation.

TEXT BOOK:

1. A. Ubald Raj and G. Jose Robin – Allied Physics Vol.I – Indra Publication 1st Edition.

REFERENCE BOOKS:

1. N. Sundararajan, George Thomas and Syed Azeez – College Physics Vol. II, United Publishers, 1st Edition 2009.
2. N. Sundararajan, George Thomas and Syed Azeez – College Physics Vol. III, United Publishers, 1st Edition 2009.
3. A. Ubald Raj and G. Jose Robin – Relativity, Wave Mechanics and Nuclear Physics, Indra Publication 1st Edition 2009.
4. N.Subramanyam , Brijlal and M.N.Avadhanulu – A text book of optics – S.Chand & Company Ltd., 23rd Edition 2006.

ALLIED PHYSICS – II (PRACTICALS)
(SUB CODE : 26 UPHE 22)

SEMESTER – II EC– P2 HOURS – 2 CREDITS – 2 TOTAL HOURS : 30

1. Grating - Oblique incidence
2. Air wedge - Thickness of wire
3. LCR Series resonance
4. LCR Parallel resonance
5. Newton's rings
6. Zener diode characteristics
7. Diode rectifier
8. Spectrometer grating normal incidence method
9. Spectrometer – Prism - determination of refractive index of glass
10. Focal length of convex lenses in contact and out of contact

ALLIED PHYSICS – I
(II B.SC., CHEMISTRY)
(COURSE CODE : 26 UPHE 31)

SEMESTER - III EC – T3 HOURS – 4 CREDITS – 3 TOTAL HOURS : 60

OBJECTIVES :

To impart basic principles of Physics that which would be helpful for students who have taken programmes other than Physics.

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

CO1 : know, various modulus involved in the materials,

CO2 : study the flow of liquids due to viscous forces and the transmission of heat due to process of conduction, convection and radiation.

CO3 : study the various laws involved in heat transformation.

CO4 : classify the various thermodynamic laws and the concept of Entropy.

CO5 : understand the phenomenon like interference and diffraction.

CO6 : study the optical activity of liquids and its uses.

UNIT - I : Elasticity

(12 Hours)

Elasticity - Bending of beams - Expression for bending moment - Uniform bending - Theory - Twisting couple on a cylindrical wire - Expression for a couple per unit twist - Work done - Torsional pendulum - Experiment to determine rigidity modulus of the wire using torsional pendulum - Acceleration due to gravity - Compound pendulum - Theory and experiment.

UNIT - II : Surface Tension

(12 Hours)

Surface tension - Excess of pressure over curved surface - Drop weight method - Coefficient of viscosity and its dimension - Stokes formula for viscous drag - Experiment to determine the coefficient of a highly viscous liquid - Flow of a liquid through a uniform capillary tube - Method of dimensions - Poiseuilles method.

UNIT - III : Specific Heat Capacity

(12 Hours)

Specific heat capacity - Calendar and Barnes continuous flow method - Variation of specific heat

capacity of solids with temperature - Variation of atomic heat of solids with temperature - Theory of specific heat - Einstein theory - Debye's theory.

UNIT- 4 : Thermal Conductivity

(12 Hours)

Lees disc experiment to determine the thermal conductivity of a bad conductor (cardboard only) - Analogy between heat flow and electric current - Weidemann - Franz law - Newtons law of cooling - Experimental verification - Experiment to determine the specific heat capacity of a liquid - Concept of pressure, volume and temperature of a gas - Mean free path - Expression for mean free path, viscosity, thermal conductivity.

UNIT - 5: Conventional Energy

(12 Hours)

Conventional energy sources - coal, oil and natural gas - Energy released in a nuclear fission and fusion - Nuclear reactor - Non conventional energy sources - Wind energy - Tidal energy - Wave energy - Photo voltaic effect - Solar cell - Solar ponds.

TEXTBOOKS:

1. A.Ubald Raj & G. Jose Robin - Properties of Matter and Optics, Indira Publications, 1st Edition.
2. A.Ubald Raj & G. Jose Robin - Allied physics, vol.2 (Thermal Physics and Sound) Indira Publications, 1st Edition.

REFERENCE BOOKS:

1. N.Sundararajan, George Thomas, Syed Azeez - College Physics Vol 1, United Publishers , 1st Edition.
3. A.Ubald Raj & G. Jose Robin - Oscillations, Properties of Matter and Energy Physics and Optics and Spectroscopy - Indira Publications, 1st Edition.
4. Brijlal - Heat and Thermodynamics and Statistical Physics, S.Chand & Company – 2010.
5. R.Murugesan - Properties of Matter S. Chand and Company – 2010.

**II B.SC. CHEMISTRY
ALLIED PHYSICS - I (PRACTICALS)
(COURSE CODE : 26 UPHE 32)**

SEMESTER - III EC - P3 HOURS - 2 CREDITS - 2 TOTAL HOURS : 30

1. Young's modulus - Uniform bending - Telescope
2. Young's modulus - Non-uniform bending - Pin & Microscope
3. Coefficient of Viscosity - Constant pressure head method
4. Surface Tension - Drop weight method
5. Acceleration due to gravity - Compound pendulum
6. Conductivity of bad conductor - Lee's disc method
7. Newton's law of cooling - verification
8. Specific heat capacity of a liquid - Newton's law of cooling
9. Torsional Pendulum - Determination of rigidity modulus

**II B.SC CHEMISTRY
ALLIED PHYSICS – II
(COURSE CODE : 26 UPHE 41)**

SEMESTER - IV EC - T4 HOURS - 4 CREDITS - 4 TOTAL HOURS : 45

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

CO1 : make the learner understand the basic principles of electricity.

CO2 : understand the applications of optics in everyday life.

CO3 : inculcate the knowledge in electronics circuits.

CO4: learn the basic concepts of relativity.

CO 5: understand the principles amplifiers and oscillators.

UNIT - I (9 Hours)

Coulomb's law – electric field – electric field due to a point charge – electric dipole – electric flux – Gauss law – applications – electric field due to a charged conducting sphere (point inside and outside) – uniformly charged cylinder (line charge) – electric potential – potential difference – relation connecting electric field and electric potential at a point – equipotential surface.

UNIT - II (9 Hours)

Self induction of a coil – calculation of self inductance of a long solenoid – alternating current – phase difference between current and voltage in alternating circuits with resistance only, capacitance only and inductance only – LR circuit – LCR series resonance circuit – LCR parallel resonance circuit(characteristics only).

UNIT - III (9 Hours)

Junction diode – biasing – pn diode equation – V-I characteristics – Zener diode – experiments – applications –Zener diode – Junction transistor – voltage-divider biasing – transistor amplifier – CE configuration – feedback principle - Barkhausen criterion for oscillations.

UNIT - IV (9 Hours)

Interference – air wedge – Newton's rings – diffraction – experiment to determine the wavelength of monochromatic light using plane transmission grating - polarization – double refraction.

UNIT - V (9 Hours)

Frame of reference – Galilean transformation – special theory of relativity – Lorentz

transformation equation – velocity transformation equations - relativistic velocity addition – length contraction – time dilation – variation of mass with velocity – Einstein’s mass energy relation.

TEXT BOOK :

1. A. Ubald Raj and G. Jose Robin – Allied Physics Vol.I – Indra Publication 1st Edition.

REFERENCE BOOKS :

1. N. Sundararajan, George Thomas and Syed Azeez – College Physics Vol. II, United Publishers, 1st Edition 2009.
2. N. Sundararajan, George Thomas and Syed Azeez – College Physics Vol. III, United Publishers, 1st Edition 2009.
3. A. Ubald Raj and G. Jose Robin – Relativity, Wave Mechanics and Nuclear Physics, Indra Publication 1st Edition 2009.
4. N.Subramanyam , Brijlal and M.N.Avadhanulu – A text book of optics – S.Chand & Company Ltd., 23rd Edition 2006.

**II B.SC. CHEMISTRY
ALLIED PHYSICS – II (PRACTICALS)
(COURSE CODE : 26 UPHE 42)**

SEMESTER – IV EC– P4 HOURS – 2 CREDITS – 2 TOTAL HOURS : 30

1. Grating - Oblique Incidence
2. Air wedge - Thickness of Wire
3. LCR Series Resonance
4. LCR Parallel Resonance
5. Newton's Rings
6. Zener Diode Characteristics
7. Diode Rectifier
8. Spectrometer Grating Normal Incidence Method
9. Spectrometer - Prism - Determination of refractive index of glass
10. Focal length of Convex lenses in contact and out of contact

ALLIED I: MATHEMATICS – I
(PHYSICS AND CHEMISTRY)
(Course Code : 26UMAE11)

Semester - I EC - 1 Hours - 6 Credits - 5

Course outcomes: By the end of the course, the students will be able to:

- CO1** Define fundamental concepts of series, algebraic equations, matrices, and statistics. **(K1)**
- CO2** Explain the nature of roots of algebraic equations and the relationships between roots and coefficients. **(K2)**
- CO3** Apply series expansions and matrix techniques to solve standard mathematical problems. **(K3)**
- CO4** Analyze algebraic equations and matrices to determine roots, rank, and eigenvalues. **(K4)**
- CO5** Evaluate correlation, rank correlation, and regression measures for given data sets. **(K5)**
- CO6** Formulate and solve real-world problems using series, algebra, matrices, and statistical methods. **(K6)**

UNIT I: **(15 hours)**

Binomial Series – Exponential Series – Logarithmic series.

(Text book 1: Chapter 1)

UNIT II: **(15 hours)**

Formation of equations - Relation between roots and coefficients -Transformation of equations.

(Text book 2: Chapter 1: Sections 1.1, 1.2, 1.4)

UNIT III: **(15 hours)**

Rank of a matrix - Cayley Hamilton theorem - Eigen values and Eigen vectors.

(Text book 2: Chapter 2: Sections 2.1, 2.3, 2.4)

UNIT IV: **(15 hours)**

Hyperbolic functions – Inverse hyperbolic functions - Logarithm of a complex number.

(Text book 1: Chapter 2, Chapter 3)

UNIT V: **(15 hours)**

Correlation – Rank Correlation – Regression.

(Text book 3: Chapter 1)

Activities:

1. Series approximation activity using standard series to estimate physical quantities such as energy, decay, and small-angle measurements.

2. Matrix and eigenvalue application workshop for solving coupled equations and studying normal modes in mechanical and electrical systems.
3. Experimental data analysis project using correlation and regression to interpret physics laboratory data.

Text books:

3. S. Arumugam and A. Thangapandi Issac, Summation of series and Trigonometry, New Gamma Publishing House, 2003.
4. S. Arumugam and A. Thangapandi Issac, Allied Mathematics paper I, New Gamma Publishing House, 2016.
5. S. Arumugam and A. Thangapandi Issac, Allied Mathematics paper IV, New Gamma Publishing House, 2004.

Reference book:

1. S. Narayanan, R. Hanumantha Rao, T.K. Maicavachagom Pillai and P. Kandaswamy, Ancillary Mathematics Volume I, Ananda book depot (SV Printers and Publishers Pvt. Ltd.), 2009.

Website and e-Learning Sources:

1. https://www.scribd.com/document/801016710/Allied-i-Allied-Mathematics?utm_source=chatgpt.com
2. https://www.youtube.com/playlist?list=PLxaL_Pkhcom8VjWs1uXw9c72SqX2QnGWy
3. https://www.scribd.com/document/806501117/Lesson-5-1-Astronomy-in-Ancient-India-1-1-1?utm_source=chatgpt.com
4. https://www.scribd.com/document/978522201/iks-q-a-notes?utm_source=chatgpt.com

ALLIED II: MATHEMATICS – II
(FOR PHYSICS)

(Course Code: 26UMAE21)

Semester - II	EC - 2	Hours - 6	Credits – 5
----------------------	---------------	------------------	--------------------

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

- CO1** Recall fundamental concepts and definitions of vector calculus, Fourier series, and differential equations. **(K1)**
- CO2** Explain the principles of vector differentiation, integral theorems, Fourier series, and differential equations. **(K2)**
- CO3** Apply Fourier series, integral theorems, and differential equation techniques to solve problems. **(K3)**
- CO4** Analyze ordinary and partial differential equations to select appropriate solution methods. **(K4)**
- CO5** Evaluate and verify solutions of differential equations and partial differential equations. **(K5)**
- CO6** Formulate mathematical models using ordinary and partial differential equations for real-world situations. **(K6)**

Unit I: **(15 hours)**

Gradient - Divergence and Curl - Line integrals. (Theorems – Statements only)

(Text book 1: Chapters 1, 3: Sections 1.3, 1.4, 3.1)

Unit II: **(15 hours)**

Surface integrals - Theorems of Green - Gauss and Stokes

(Text book 1: Chapter 3: Sections 3.2, 3.3)

Unit III: **(15 hours)**

Fourier series - Full range - Half range sine series – Half range cosine series

(Text book 1: Chapter 4: Sections 4.2, 4.3)

Unit IV: **(15 hours)**

Linear equation with constant coefficients - Methods of finding complementary functions - Methods of finding particular integrals - Homogeneous linear equations.

(Text book 2: Chapter 6: Sections 6.1- 6.4)

Unit V: **(15 hours)** Formation of

partial differential equations - First order partial differential equations - Methods of solving first order partial differential equations - Some standard forms.

(Text book 2: Chapter 7)

Activities:

1. Physical field analysis activity using gradient, divergence, curl, and Green–Gauss–Stokes theorems in electrostatic and fluid flow problems.
2. Fourier series application task to represent and analyze physical waveforms such as heat flow and vibrating strings.
3. Differential equation modeling workshop solving ODEs and PDEs arising in motion, heat conduction, and wave propagation.

Text books:

1. S. Arumugam and Issac, Allied Mathematics paper II, Vector Calculus and Fourier series, New Gamma Publishing House, 2016.
2. S. Arumugam and Issac, Allied Mathematics paper II, New Gamma Publishing House, 2007.

Website and e-Learning Source:

1. https://people.bath.ac.uk/masrs/ma20010/chap1.pdf?utm_source=chatgpt.com
2. https://www.math.unileipzig.de/~konarovskiy/teaching/2019/Math3/pdf/notes/notes.pdf?utm_source=chatgpt.com
3. [FEARLESS INNOCENT MATH - YouTube](#)
4. [Astronomy - India - Indian Scriptures](#)
5. https://arxiv.org/abs/1101.0315?utm_source=chatgpt.com

ALLIED CHEMISTRY- I (FOR PHYSICS)

SUBJECT CODE: 26UCHE31

Semester: III	EC-T3	Credit: 3	Hours/W : 4
---------------	-------	-----------	-------------

Course Outcomes: At the end of the course, the students should be able to

- CO1:** Recall and describe fundamental concepts of atomic structure, periodic classification of elements and acid–base theories (K1)
- CO2:** Explain the principles of chemical bonding, bonding theories and periodic trends in atomic structure and predict bond order (K2)
- CO3:** Apply theoretical principles to determine electronic configurations and calculate oxidation numbers (K1, K2, K3)
- CO4:** Analyze trends in atomic properties, bonding characteristics, thermodynamic functions and interpret Born–Haber cycles, lattice energy, and equilibrium relationships (K4)
- CO5:** Evaluate the fundamental concepts of qualitative analysis inorganic compounds (K5)
- CO6:** Demonstrate systematic qualitative analysis of cations and anions, ensuring proper laboratory techniques, hazard management, waste disposal practices, and adherence to laboratory safety protocols (K6)

UNIT I Atomic Structure and Periodic Table

12 Hrs

Bohr model of atom - Atomic spectrum of hydrogen and Bohr theory - Refinement of the Bohr theory - Dual nature of electrons particles or waves - Quantum numbers and its significance - Uncertainty principle - Paul's exclusion principle, Hund's rule - Periodic table - Modern periodic table - Long form of periodic table - Division of elements into s, p, d and f blocks - Bohr's aufbau principle electronic configuration of ground state of atoms up to K(Z=19)- Trends in atomic properties Ionization energy, successive ionization energy , electron affinity, electro negativity Pauling, Mulliken and Allred Rochow's scale

Self-study: Fundamentals of atomic structure, atomic number, mass number

UNIT II Structural and Chemical Bonding 12 hrs

Types of chemical bond - Electrovalent bond (conditions for formation and associated properties) - Covalent bond (conditions for formation and associated properties) - Coordinate covalent bond - Orbital overlap ss, sp, pp overlap - Sigma and pi bond formation of N₂ and O₂ properties - Polar and non-polar molecules - Dipole moment and its applications - VSPER theory application to CH₄, NH₃ and H₂O - Molecular orbital theory, bonding, antibonding and

non-bonding orbitals - MO diagrams for H_2 , He_2 , N_2 and O_2 bond order.

Self-study: Ionic bond, covalent bond, Coordinate bond

UNIT III Solid State and Energetics

12 hrs

Macroscopic properties of solids - Types of characteristics of crystals - Covalent solids structure and properties of diamond and graphite - Ionic crystals solid NaCl - Metallic crystals- Molecular crystals intermolecular forces - Metals - free electron theory and band theory of metallic bond - Superconductors - Lattice energy- Born Haber cycle - Law of conservation of energy- Enthalpy of reactions - Entropy and Gibbs energy- Relationship between Gibbs energy and equilibrium.

Self-Study: Difference between crystalline and amorphous substances

UNIT IV Acids, Bases and Redox Processes

12 hrs

Concept of acids and bases - Arrhenius concept - Bronsted Lowry concept conjugate acids and bases - Lewis concept - Effect of solvents and substituents on relative strengths of acids and bases – Hydrolysis - Ionization of water- pH scale definition of pOH, pK_a , pK_b simple numerical problem - Buffer solution - Redox processes - Electronic concept of oxidation and reduction - Oxidation number rules - Calculation of oxidation number of elements in neutral molecules and in ions - Balancing ionic equation by oxidation number method.

Self-Study: Ideas on acids, bases and salts

UNIT V Practical Chemistry-I: Qualitative Analysis

12 hrs

Introduction acquaintance with chemical laboratory equipment's solid reagents, liquid reagents and test papers laboratory instructions and some don'ts Bunsen burner (self-study) - Chemistry involved in the analysis of anion and cations - Dry tests (action of heat, flame test, filter ash test) - Wet test (with acids, with Na_2CO_3 extract) - Elimination of interfering anions and preparation of original solutions - Classification of cations into analytical groups - Condition for precipitation, application of solubility product and common ion effect in qualitative analysis - Safety in laboratory - General safety measures (safety equipment, safety notices, personal protection, dangers to avoid) - Chemical hazards (corrosive, irritant substances, toxic compounds, flammable explosives) - Physical hazards (fire, pressure) fire extinguisher - Spillage and waste disposal - First aid (immediate assistance, burns, eye injuries, bleeding, toxic materials) first aid kit.

Self-Study: Simple salt analysis.

Note: Course materials will be supplied to the students

ALLIED CHEMISTRY PRACTICAL – I (FOR PHYSICS)

**Inorganic qualitative
analysis (Subject Code:
26UCHE32)**

Semester: III	EC-P4	Credit: 2	Hours/W : 2
----------------------	--------------	------------------	--------------------

Course outcomes:

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

CO 1: Explain and demonstrate the techniques of elimination of interfering radicals (K2)

CO 2: Apply the physical and chemical properties of various ions in the identification of unknown samples (K3)

CO 3 : Categorize the metal ions into different groups. (K3)

CO 4 : Identify the presence of inorganic salts in biological samples. (K4)

CO 5 : Separate ions using common ion effect and solubility product (K5)

CO 6 : Analyze samples using microscale techniques (K4)

ANIONS: Carbonate, Borate, Fluoride, Oxalate and Phosphate

CATIONS: Lead, Bismuth, Copper, Cadmium, Cobalt, Nickel, Manganese, Zinc, Barium, Strontium and Ammonium

Note: Laboratory manual is supplied

ALLIED CHEMISTRY- II (FOR PHYSICS)

SUBJECT CODE: 26UCHE41

Semester: IV	EC-T4	Credits : 3	Hours / W : 3
--------------	-------	-------------	---------------

Course Outcomes (COs):

After completion of the course, the students will be able to

CO1: Recall the fundamental concepts of hybridization (sp , sp^2 , sp^3), isomerism electrochemical cells, molecular properties, secondary bonding interactions, energy materials and principles of volumetric analysis. (K1, K2)

CO2: Explain and apply the principles and the laws governing electrochemistry and titration methodologies (K2)

CO3: Apply the principles hybridization, relationship between molecular properties, electrochemistry and volumetric analysis (K3)

CO4: Analyse Optical activity, differences between different energy materials, trends in molecular properties and potentiometric titrations (K4)

CO5: Evaluate the suitability of materials for energy harvesting and storage, the applications of volumetric titrations (K5)

CO6: Demonstrate volumetric analysis, Electrochemical cell setups and potentiometric titration systems, selection of suitable renewable energy materials (K6)

UNIT I Fundamentals of Organic Chemistry

9 hrs

Hybridization- Need for the concept of hybridization- sp , sp^2 and sp^3 hybridization with suitable examples- Isomerism in organic compounds- Structural isomerism types with example- Stereoisomerism conformational, geometrical and optical isomerism- Geometrical isomerism cis and trans nomenclature- Optical isomerism elemental of symmetry chirality optical activity, enantiomers, diastereomers, mesomer and racemic mixture optical activity exhibited by lactic acid and tartaric acid.

Self-study: Fundamentals of isomerism and hybridization.

UNIT II Bonding and water treatment

9 hrs

Coordinate bonding with example. Pauling's theory – Postulates - Applications to $[\text{Ni}(\text{CO})_4]$, $[\text{Ni}(\text{CN})_4]^{2-}$, $[\text{Co}(\text{CN})_6]^{3-}$. Metallic bonding: Free electron theory and band theory. Water treatment

methods: Ion exchange, electro dialysis and reverse osmosis. Dipole moment- o, p-Nitrophenol. Hydrogen bonding-types and applications-Van der Waal's forces. Colligative properties -K_b, K_f. Rast method.

Self-study: Non-bonding (Secondary bonding) interactions

UNIT III Electrochemistry

9 hrs

Introduction- Requirements of an electrochemical change- Electrochemical cells difference between electrolytic and galvanic cells- Salt bridge- Electrode potential and standard electrode potential- Electrochemical series and applications- Conventions used in electrode representation and in cell representation- Types of electrodes description of hydrogen, calomel and glass electrodes Nernst equation- Weston cadmium cell- Experimental determination of a cell emf and determination of electrode potential simple calculation- Potentiometric titrations and their advantages principle and method of acid base, redox and precipitation titrations- Determination of pH using hydrogen, glass and quinhydrone electrodes

Self-study: Electrolysis and galvanic cells

UNIT IV Energy Materials

9 hrs

Primary Cells, Secondary cells, Dry Cells, Rechargeable batteries. Materials used – applications - Li-ion battery - Ni-MH battery. Fuel cells, Materials used in fuel cells. Photovoltaic effect- principle of solar energy conversion into electricity. Dye sensitized solar cells. Hydrogen production methods. Hydrogen storage materials – Metal-organic frameworks (MOFs). Conducting polymers and super conductors.

Self-study: Renewable energy

UNIT V Practical Chemistry II- Volumetry

9 hrs

Introduction definition of various terms (titrations, volumetric analysis, titrant indicator, end point requirements of the reaction selected for the titration common types of titrations. Law of equivalence equivalent weight of acids, bases, oxidizing agents, reducing agents and salts calculation of molecular weights and equivalent weights. Requirements of a primary standard - Secondary standards- Numerical problems in the preparation of solutions- Law of normalities preparation of HCl, H₂SO₄, HNO₃

(approximately 0.1N) from standard acids- Principles behind - Acid base titration - pH verses volume curves, choice of indicators form different acid base titrations- Permanganimetry- Dichrometry- diphenylamine and potassium ferricyanide as indicators- Iodimetry Preparation of iodine and starch solutions - starch as indicators- Iodometry- Role of KMnO_4 and $\text{K}_2\text{Cr}_2\text{O}_7$.

Self-study: Preparation of solution at different concentration

Note: Course materials will be supplied to the students

ALLIED CHEMISTRY PRACTICAL – II (FOR PHYSICS)
Inorganic Quantitative Analysis (Subject Code: 26UCHE42)

Semester: IV	EC-P4	Credit: 2	Hours/W: 2
---------------------	--------------	------------------	-------------------

Course outcomes:

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

CO1: Recall the basic principles of Volumetric Analysis (K2)

CO2: Explain the types of reactions behind titrimetric methods and the role of Indicators (K1, K2)

CO3: Apply the laws of volumetric titrations to calculate the quantity of the substance present in the given solution (K3)

CO4: Analyse the quantitatively the given substance using the principles for neutralization and redox reactions (K3)

CO5: Demonstrate the choice of titration pair and indicators for acid-base titrations and redox titrations (K5, K6)

CO 6: Design titrations by choosing suitable the titration pair, indicators and experimental conditions and carry out the quantitative analysis (K4)

S. No	Estimation	Link	Standard
1	Strong Acid	Weak Base/Strong Base	Strong Base
2	Strong Acid	Strong Base	Weak Acid
3	Strong Base	Strong Acid	Weak Base
4	Oxalic acid	Potassium Permanganate	Oxalic acid
5	Ferrous Sulphate	Potassium Permanganate	Ferrous Ammonium Sulphate
6	Potassium dichromate	Ferrous Sulphate	Potassium dichromate
7	Ferrous Ammonium Sulphate	Potassium dichromate	Ferrous Sulphate
8	Potassium Permanganate	Sodium thiosulphate	Potassium dichromate
	Magnesium Sulphate	EDTA	Zinc Sulphate
10	Zinc Sulphate	EDTA	Magnesium Sulphate

Note: Laboratory manual will be supplied.