

B.Sc. MATHEMATICS

LOCF SYLLABUS 2026



Department of Mathematics

School of Computing 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 (TANSCHÉ) 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 : B.Sc. Mathematics

Programme Code: UMT

PROGRAMME OUTCOMES

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

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 centred 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.

Program Specific Outcomes:

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

PSO1: Mathematical Foundations: Grasp and apply foundational concepts in algebra, calculus, geometry, and analysis to build a strong theoretical base in mathematics.

PSO2: Mathematical Reasoning and Logic: Identify, formulate, and analyze complex problems for reaching substantiated conclusions using the theories learned in all courses.

PSO3: Computational Techniques: Design solutions for complex problems and design system components or procedures that can build the theories of different courses and pave the way for evaluating those theories.

PSO4: Conduct Investigations of Complex Problems: Use research-based knowledge and methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions.

PSO5: Create an Application: Integrate different procedures learned in all courses to develop analytical thinking and formulate new procedures or models that may lead to the creation of mathematical or real-world applications.

PSO6: Abstraction and Structural Thinking: Understand and manipulate abstract mathematical structures such as groups, rings, vector spaces, and topological constructs.

PSO7: Problem Solving and Theoretical Modelling: Translate real-world and theoretical problems into mathematical models and solve them using analytical or computational approaches.

PSO8: Preparation for Advanced studies and careers: Equip students with the skills and knowledge necessary for higher studies in mathematics and related disciplines, competitive exams, and careers in teaching, industry, and research.

B.Sc. Mathematics Course Pattern

Sem	Part	Status	Sub. Code	Title of the Paper	Hrs	Cdt
I	I	Lang	26UGTL11	General Tamil – I	6	3
	I	Lang	26UGHL11	Hindi – I		
	I	Lang	26UGFL11	French – I		
	II	Lang	26UGEL11	General English - I	6	3
	III	Core-T1	26UMTC11	Algebra and Trigonometry	4	4
	III	Core-T2	26UMTC12	Differential Calculus	4	4
	III	EC-T1	26UPHE11	Allied I : Physics	4	3
	III	EC-P1	26UPHE12	Allied I : Physics Practical	2	2
	IV	SEC-1	26UMTN11	Numerical Ability (NME)	2	2
	IV	FC	26UHER11/ 26UHEE11	Foundation Course: Religion: Catholic Doctrine/Ethics	2	2
Sub Total					30	23
II	I	Lang	26UGTL21	General Tamil – II	6	3
	I	Lang	26UGHL21	Hindi – II		
	I	Lang	26UGFL21	French – II		
	II	Lang	26UGEL21	General English - II	6	3
	III	Core-T3	26UMTC21	Analytical Geometry	4	4
	III	Core-T4	26UMTC22	Integral Calculus & Vector Calculus	4	4
	III	EC-T2	26UPHE21	Allied II : Physics	4	3
	III	EC-P2	26UPHE22	Allied II : Physics Practical	2	2
	IV	SEC-2	26UMTN21	Mathematics for Competitive Examinations (NME)	2	2
	IV	SEC-3	26UHEI21	Integrated Personality Development	2	2
Sub Total					30	23

Sem	Part	Status	Sub. Code	Title of the Paper	Hrs	Cdt
III	I	Lang	26UGTL31	General Tamil – III	6	3
	I	Lang	26UGHL31	Hindi – III		
	I	Lang	26UGFL31	French – III		
	II	Lang	26UGEL31	General English - III	6	3
	III	Core-T5	26UMTC31	Sequences and Series	5	5
	III	Core-T6	26UMTC32	Differential Equations, Laplace Transforms and Fourier Series	5	4
	III	EC-T3	26UMTE31	Allied III: Statistics and Spreadsheet Analysis	4	4
	IV	SEC-4	26UHEL31	Life Issues and Entrepreneurial Skill Development	2	2
	IV	SEC-5	26UMAS31	Fundamentals of Power BI and AI Practical	2	2
Sub Total					30	23
IV	I	Lang	26UGTL41	General Tamil - IV	6	3
	I	Lang	26UGHL41	Hindi – IV		
	I	Lang	26UGFL41	French – IV		
	II	Lang	26UGEL41	General English - IV	6	3
	III	Core-T7	26UMTC41	Real Analysis	6	6
	III	EC-T4	26UMTE41	Allied IV: Advanced Statistics	6	6
	IV	EC- T5	26UMTE42	Discrete Mathematics / Astronomy / Combinatorics	4	4
	IV	EVS	26UEVS41	Environmental Studies	2	2
	V	Extension Activities		STAND	-	1
Sub Total					30	25
Sem	Part	Status	Sub. Code	Title of the Paper	Hrs	Cdt
V	III	Core-T8	26UMTC51	Abstract Algebra	6	5
	III	Core-T9	26UMTC52	Modern Analysis	6	4

	III	Core-T10	26UMTC53	Graph Theory	5	4
	III	Core-T11	26UMTC54	Python and Data Analysis	4	3
	III	Core-P3	26UMTC55	Python and Data Analysis Practical	2	2
	III	EC-T6	26UMTE51	Linear Programming and Game Theory / Operations Research / Number Theory	5	4
	IV	VE	26UVEH51	Human Rights and Social Analysis	2	2
	IV	Internship	26UMTI51	Internship	-	2
Sub Total					30	26
VI	III	Core-T12	26UMTC61	Linear Algebra and Lattices	6	4
	III	Core-T13	26UMTC62	Complex Analysis	6	4
	III	Core-T14	26UMTC63	Mechanics	6	4
	III	Core-T15	26UMTC64	Project with viva voce	5	3
	III	EC-T7	26UMTE61	Numerical Methods / PHP, Database Integration and Web Security/ Introduction to Machine Learning / Introduction to Data Science	5	3
	IV	SEC-6	26UMTS61	Techniques in Reasoning	2	2
Sub Total					30	20
					180	140

Additional Compulsory Courses:

I Year (Add –On Course)		2
II Year (Value–Added Course)		2
III Year (Extra–Credit Course)		2
Field Visit /Industrial Visit		1
MOOC		2
Cocurricular / Extra Curricular Activities		1
TOTAL	180	150

ADD ON Course

Part	Course Code	Title of the Paper	Cdts
V	26UMTAO1	Mathematical Quotient	2

VALUE ADDED Courses

	Part	Course Code	Title of the Paper	Cdts
Any one	V	26UMTVA1	Mathematical Aptitude	2
	V	26UMTVA2	Training for JAM Examination	2

Extra Credit Courses

	Part	Course Code	Title of the Paper	Cdts
Atleast one	V	26UMTEC1	R Programming	2
	V	26UMTEC2	Data Analytics	2
	V	26UMTEC3	Statistical Methods	2
	V	26UMTEC4	Quantitative Aptitude	2
	V	26UMTEC5	History of Mathematics	2
	V	26UMTEC6	Fundamentals of Web Development	2

Extra Credit Courses for other major students

Sem	Part	Course Code	Title of the Paper	Cdts
I	V	26UMTEC7	Set Theory	2
II	V	26UMTEC8	Analytical Geometry of Two Dimensions	2
III	V	26UMTEC9	Python	2
IV	V	26UMTEC10	Classical Algebra	2
V	V	26UMTEC11	Differentiation and Integration	2
VI	V	26UMTEC12	Introduction to Astronomy	2

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 அறிமுகப்படுத்துவதுவதால் 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.சு.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 சுவேரியார் 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 – 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 ல்லது 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. திருக்காவலூர்க்கலம்பகம் - சமூகஉல்லாசம் 4. முக்கூடற்பள்ளு-நாட்டு வளம் 5. தமிழ்விடுதாது - தூதுக்கானகாரணம்	30
II	ஊரைநடை 1. இறைநம்பிக்கையும் மனிதவாழ்வும் 2. இயேசுபிரான் குறிப்பிடும் எண்வகைமனிதர்கள் 3. நபிகள் நாயகத்தின் வாழ்வியல் நெறிகள் 4. திருமுலர் காட்டும் இறைநெறி 5. வள்ளலார் கூறும் வாழ்வியல் நாவல் - கருப்பாயி என்கிற நூர்ஜஹான் -அன்வர் பாலசிங்கம்	15
III	தமிழ் இலக்கியவரலாறு (பக்திஇலக்கியம்,சிற்றிலக்கியம் தொடர்பானபகுதிகள்)	15
IV	இலக்கணம்	15

	சொல்லின் இலக்கணம்-பெயர் ,வினை, இடை,உரிச்சொற்கள் பிறமொழிச் சொற்களைத் தமிழில் வழங்கும் முறை	
V	மொழிபெயர்ப்பு ஆட்சிச் சொல்லகராதி - மரபுத் தொடர்கள் -பழமொழிகள் - திருக்குறள்	15

TEXT BOOKS (பாடநூல்கள்)

1. தமிழ்த்துறைவெளியீடு - தாயசவேரியார் 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 தனித்துவங்களைவிளங்கிக் 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 பயிற்சியளித்தல;.(K6)						

UNITS	SYLLABUS CONTENTS	HOURS
I	1. சிலப்பதிகாரம் - வழக்குரைக் காதை. 2. மணிமேகலை- ஆபுத்திரன் திறம் அறிவித்தகாதை. 3. சீவகசிந்தாமணி- பதுமையர் இலம்பகம். 4. கம்பராமாயணம் - மந்தரைச் சூழ்ச்சிப் படலம்.	30
	1. சூளாமணி 2. உதயணகுமாரகாவியம் 3. இயேசுகாவியம் 4. மருமக்கள் வழி மான்மியம்	
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 -	15

	யாப்பு,எழுத்து, அசை. சீர்,தளை, அடி,தொடை,பா வகைகள்	
V	ஊடகத்தமிழ் - விளக்கம், வகைகள்,செயல்பாடுகள் 1.இதழ்கள் 2.வானொலி 3.தொலைக்காட்சி 4.திரைப்படம்	15

TEXT BOOKS (பாடநூல்கள்)

- தமிழ்த்துறைவெளியீடு-தூயசுவேரியார்க் 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 – tamilebooksdownloads.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 வமை,உருவகம்,பிறிதுமொழிதல்,வஞ்சப்புக்கழ்ச்சி,தற்குறிப்பேற்ற அணி)	15
V	மொழிப்பயிற்சி 1. ஒப்பும் மறுப்பும் (ஒருகருத்தினை வெட்டி,ஒட்டி எழுதும் பயிற்சி) 2. விண்ணப்பம் எழுதுதல் (பயிற்சி) 3. தமிழில் தன்விவரக் குறிப்புரைதல் (பயிற்சி)	15

	4. மேடைப்பேச்சு நுட்பங்கள் (நேர்முகப் பயிற்சிமற்றும் மதிப்பீடு)	
TEXT BOOKS (பாடநூல்கள்)		
1. பொதுத்தமிழ் பாடநூல், தமிழ்த்துறை வெளியீடு ,தூய சுவேரியார் கல்லூரி,பாளையங்கோட்டை. 2. பாக்கியமேரி,தமிழ் இலக்கியவரலாறு,பதினொன்றாம் பதிப்பு - 2025 ,பூவேந்தன் பதிப்பகம்,மயிலாப்பூர்,சென்னை. 3. சுப்ரபாரதிமணியன்இமண் 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, baap 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 priksa par aadharit Computer sambandhit prashikshan Karya

- Hindi mein Powerpoint banana
- Hindi mein Google Document taiyar karna
- Hindi mein Google form taiyar karna
- Vibhinna pratiyogi pariksha 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 multiculturalisme.
Projet:	faire une liste des camardes 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: Preperer un employ du temps avec des activites faites pe dant la semaine.

UNIT. III

Communication: Parler du passe, Raconter le week end dernier.
Grammaire : Le passe compose avec l'auxilaire 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'auxilaire 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: Imginer 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.
Courses I –VI –*Intermediate English Grammar* by Raymond Murphy. Cambridge University
Press, 1999.

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
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: Medical Terms/ Names of Ailments/People /Currency/ Countries and Capitals/ World famous Cities (25)
2. Conversation: Making Requests/Offering help/Seeking Permission /Expressing Gratitude (25)
3. Reading Aloud (from the Prescribed Text) (25)
4. Narrating a Story (from Hints) (25)

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
6. Extempore

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	

COURSE – VII

Hours: 6

Course Code: 26UGEL47

Credits: 3

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) ERC from Unit I/ Short answers from Units II, III & IV	15
• 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	TOTAL HOURS: 30
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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
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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 (2nd ed.), 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
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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
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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
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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	/E	HOURS:2	CREDITS:2	TOTAL HOURS:30
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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.

ALGEBRA AND TRIGONOMETRY

(Course Code: 26UMTC11)

Semester - I

Core -T1

Hours - 4

Credits – 4

Course Outcomes: By the end of the course the students will be able to

CO1 Apply algebraic techniques to solve reciprocal equations (K3)

CO2 Select the suitable method such as Sturm's theorem, Removal of terms etc. to solve algebraic equations (K5)

CO3 Describe the sum of binomial, exponential and logarithmic series (K1)

CO4 Develop the power series of sine and cosine and that of multiples (K6)

CO5 Discuss hyperbolic functions and logarithm of a complex number (K2)

CO6 Discuss the different methods of summation of trigonometric series (K2)

UNIT - I:

(12 hours)

Reciprocal Equation – To increase or decrease the roots of a given equation – Form of the quotient and remainder when a polynomial is divided by a binomial – Removal of terms.

(Textbook 1- Chapter 6: Sections - 16 to 19)

UNIT - II:

(12 hours)

Descartes' rule – Rolles' theorem – Sturm's theorem – Newton's method of divisors – Horner's method.

(Textbook 1: Chapter 6: Sections 24, 25, 27, 29.4, 30)

UNIT - III:

(12 hours)

Application of Binomial theorem to the summation of series – Approximation values – Exponential summation – The Logarithmic series (Theorems without proof) – Series which can be summed by the logarithmic series.

(Textbook 1: Chapter 3: Sections 10, 14; Chapter 4: Sections 3, 5, 9)

UNIT - IV:

(12 hours)

Expansions of $\sin n\theta$, $\cos n\theta$ - Expansion of $\tan n\theta$ in powers of $\tan \theta$ - Expansions of $\tan(A+B+C+\dots)$ (Excluding examples on formation of equations) – Powers of sines and cosines of θ in terms of functions of multiple of θ – Expansions of $\sin\theta$, $\cos\theta$ in a series of ascending powers of θ .

(Textbook 2: Chapters 3: Sections 1 - 5)

UNIT - V:

(12 hours)

Hyperbolic functions – Logarithms of complex quantities.

(Textbook 2 - Chapter 4, Chapter 5: Section - 5)

Activity:

Assignment related to binomial series, logarithmic series, exponential series

Text book:

1. T. K. ManicavachagomPillay, T. Natarajan, K.S. Ganapathy, Algebra, volume I, Ananda book depot, 2024.
2. S. Narayanan, T. K. ManicavachagomPillay, Trigonometry, S.Viswanathan (Printers and Publishers) PVT. LTD, 2008.

Reference books:

1. C. V. Durell and A. Robson, Advanced Trigonometry, Courier Corporation, 2003.
2. J. Stewart, L. Redlin, and S. Watson, Algebra and Trigonometry, Cengage Learning, 2012.

E-learning resources:

1. <https://www.mathcentre.ac.uk/resources/uploaded/mc-ty-cubicequations-2009-1.pdf>
2. <https://youtu.be/0KPopE1ukGc>

DIFFERENTIAL CALCULUS

(Course Code: 26UMTC12)

Semester - I

Core -T2

Hours - 4

Credits - 4

Course Outcomes: By the end of the course the students will be able to

- CO1 Recall the basic formulae in differentiation (K1)
- CO2 Discuss radius of curvature and evolutes using various methods (K2)
- CO3 Use the Leibnitz theorem to find derivatives (K3)
- CO4 Determine derivation using Euler's theorem (K3)
- CO5 Demonstrate the applications of differentiation and Jacobians (K3)
- CO6 Evaluate maxima and minima functions (K5)

UNIT - I: (12 hours)

Successive Differentiation: Introduction (Review of basic concepts) – The n^{th} derivative – Standard results – Fractional expressions of the form – Trigonometrical transformation – Formation of equations involving derivatives – Leibnitz formula for the n^{th} derivative of a product.

Contributions of Baskara Acharya in differential calculate (reference: e-learning resource)

(Chapter 3: Sections 1.1 – 1.6, 2.1)

UNIT - II: (12 hours)

Envelope: Method of finding the envelope – Another definition of envelope – Envelope of family of curves which are quadratic in the parameter -

(Chapter 10: Sections 1.1 – 1.5)

UNIT - III: (12 hours)

Curvature: Definition of Curvature – Circle, Radius and Centre of Curvature – Cartesian formula for the radius of curvature - Evolutes and Involutives – Radius of Curvature when the curve is given in Polar Co-ordinates

(Chapter 10: Sections 2.1 – 2.3, 2.5-2.6)

UNIT - IV: (12 hours)

Partial Differentiation: Successive partial derivatives – Function of a function rule – Total differential coefficient – A special case – Implicit Functions.

(Chapter 8: Sections 1.1 – 1.5)

UNIT - V: (12 hours)

Partial Differentiation (Continued): Homogeneous functions – Partial derivatives of a function of two functions – Maxima and Minima (Theorems without proof)

(Chapter 8: Sections 1.6 – 1.7 & Chapter 5: Sections 1.1 -1.5)

Skill-Oriented Activities:

- Compute higher-order derivatives using standard results and trigonometric transformations.
- Analyse and compute total differential coefficients in multi-variable functions.
- Analyze and evaluate maxima and minima of functions involving two variables.

- Understand the concept of envelopes and visualize families of curves.
- Solve practical problems involving curvature and evolutes, such as road design and mechanical systems.

Text Book :

S. Narayanan and T. K. Manicavachagompillay, Calculus Volume I, S.Viswanathan (Printers & Publishers) Pvt. Ltd.2004.

Reference Books :

1. H. Anton, I. Birens and S. Davis, Calculus, John Wiley and Sons, Inc., 2002.
2. G.B. Thomas and R.L. Finney, Calculus, Pearson Education, 2010.
3. M.J. Strauss, G.L. Bradley and K. J. Smith, Calculus, 3rd Ed., Dorling Kindersley (India) P. Ltd. (Pearson Education), Delhi, 2007.

E-learning resources:

1. <https://sanskritarticle.com/wp-content/uploads/22-63-Yennam.Shivakumar.pdf>

ALLIED PHYSICS – I

(Course Code: 26UPHE11)

Semester – I EC – T1 Hours – 4 Credits – 3 Total Hours: 90

OBJECTIVE

To impart the basic principles of Physics that are useful for students pursuing programmes other than Physics and to provide a foundation for understanding physical phenomena relevant to science and technology.

Course Outcomes: By the end of the course the students will be able to

- CO1** Explain the concepts of elasticity, bending of beams, torsional oscillations, and determine elastic constants of materials. (K2)
- CO2** Analyze the phenomena of surface tension and viscosity and apply the related principles to fluid flow problems and experiments. (K4)
- CO3** Explain the concepts of specific heat capacity and compare the Einstein and Debye theories of specific heat of solids. (K2)
- CO4** Apply the principles of thermal conductivity, Newton's law of cooling, and kinetic theory of gases to solve physical problems. (K3)
- CO5** Distinguish between conventional and non-conventional energy sources and explain their methods of energy production and utilization. (K4)
- CO6** Apply experimental techniques to determine physical quantities such as rigidity modulus, viscosity, surface tension, thermal conductivity, and specific heat capacity. (K3)

UNIT – I: Elasticity (12 Hours)

Elasticity – Bending of beams – Expression for bending moment – Uniform bending – Theory – Twisting couple on a cylindrical wire – Expression for 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 and Viscosity (12 Hours)

Surface tension – Excess pressure over curved surfaces – Drop weight method – Coefficient of viscosity and its dimensions – 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 – Poiseuille's method.

UNIT – III: Specific Heat Capacity (12 Hours)

Specific heat capacity – Callendar 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 – IV: Thermal Conductivity (12 Hours)

Lee's disc experiment to determine the thermal conductivity of a bad conductor (cardboard only) – Analogy between heat flow and electric current – Wiedemann–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 – Expressions for mean free path, viscosity and thermal conductivity.

UNIT – V: Conventional and Non-Conventional Energy Sources (12 Hours)

Conventional energy sources – Coal, oil and natural gas – Energy released in nuclear fission and fusion – Nuclear reactor – Non-conventional energy sources – Wind energy – Tidal energy – Wave energy – Photovoltaic effect – Solar cell – Solar ponds.

TEXT BOOKS

1. A. Ubald Raj and G. Jose Robin, Properties of Matter and Optics, Indira Publications, First Edition.
2. A. Ubald Raj and G. Jose Robin, Allied Physics, Vol. II (Thermal Physics and Sound), Indira Publications, First Edition.

REFERENCE BOOKS

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

ALLIED PHYSICS – I (PRACTICAL)

(Course Code: 26UPHE12)

Semester – I EC – P1 Hours – 2 Credits – 2 Total Hours: 30

LIST OF EXPERIMENTS

1. Young's Modulus – Uniform Bending (Telescope Method)
2. Young's Modulus – Non-Uniform Bending (Pin and Microscope Method)
3. Coefficient of Viscosity – Constant Pressure Head Method
4. Surface Tension – Drop Weight Method
5. Acceleration due to Gravity – Compound Pendulum
6. Thermal Conductivity of a 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 Method
9. Torsional Pendulum – Determination of Rigidity Modulus

NUMERICAL ABILITY (NME)

(Course Code: 26UMTN11)

Semester-I

SEC -1

Hours -2

Credits - 2

Course Outcomes: By the end of the course the students will be able to

- CO1** Recall the basic formula to solve the day today problems (K1)
- CO2** Discuss HCF and LCM of numbers (K2)
- CO3** Apply BODMAS rule to solve the problems (K3)
- CO4** Solve problems related to time and distance (K3)
- CO5** Analyze the concepts of Time and Work (K4)
- CO6** Compare between the simple interest and compound interest (K5)

Eligibility: All UG students except those from the Department of Mathematics.

UNIT - I: (6 hours)
Numbers (test of divisibility) - HCF and LCM of numbers.

(Chapters 1 and 2)
(6 hours)

UNIT - II:
Decimal fractions - Simplification (BODMAS rule).

(Chapters 3 and 4)
(6 hours)

UNIT - III:
Square roots and cube roots - Average - Problems on ages.

(Chapters 5, 6 and 8)
(6 hours)

UNIT - IV:
Profit and loss , Time and work.

(Chapters 11 and 15)
(6 hours)

UNIT - V:
Time and distance, Simple Interest - Compound Interest.

(Chapters 17, 21 and 22)

Text Book:

R.S. Aggarwal, Quantitative aptitude for competitive examination, S. Chand, (2022), Edition 4.

Reference Books:

1. Topic-wise solved papers for IBPS/SBI Bank PO/ Clerk prelims and Mains (Quantitative Aptitude – 2010-16), Disha publication.
2. Quantitative Aptitude, P. Gupta, Unique publishers.

E-learning Resources:

- <https://nptel.ac.in/>
- <https://www.geeksforgeeks.org/quantitative-aptitude/>
- <https://www.khanacademy.org/math>

- <https://wpassets.adda247.com/wp-content/uploads/multisite/sites/2/2023/02/28172738/100-Reasoning-Questions-With-Solutions-for-SSC-CGL-Tier-2-Exam.pdf>

QUESTION PATTERN

Internal Assessment (CIA)

Part A	Answer All: 15 objective-type Questions $\times$ 1 mark = 15 marks
Part B	Answer 10 Short Questions (out of 12) $\times$ 2 marks = 20 marks
Total Marks	35

Semester Examination

Total Number of Questions	60 (12 Objective-Type Questions for Each Unit)
Answer	50 Questions $\times$ 2 marks = 100 marks
Total Marks	100

ANALYTICAL GEOMETRY

(Course Code: 26UMTC21)

Semester - II

Core -T3

Hours - 4

Credit - 4

Course Outcomes: By the end of the course students will be able to

- CO1** Recollect the concepts of direction cosines, angle between two lines and projection on a straight line (K1)
- CO2** Understand the relations between directions of lines and the geometric interpretation of projections in space (K2)
- CO3** Apply the general and normal forms of a plane to find angles, intercepts and system of planes (K3)
- CO4** Apply methods to determine perpendicular distance, orthogonal projection and volume of tetrahedron in three-dimensional geometry (K3)
- CO5** Analyze the relationships between lines and planes such as coplanarity, skew lines, shortest distance and intersections (K4)
- CO6** Solve problems related to spheres including equations, sections, intersections and orthogonality in three dimensions (K3)

UNIT - I: (12 hours)

Angle between two lines – Direction Cosines of a line – relation between directions on a straight line- Projection on the straight line .

(Chapter: 1: Sec: 1.5, 1.6, 1.7, 1.8, 1.9)

UNIT - II: (12 hours)

General equation of the first degree, plane- Normal form – angle between two planes – Intercepts of plane through three points - System of Planes – Two sides of plane

(Chapter: 2: Sec: 2.1, 2.2, 2.3 2.4, 2.5, 2.6)

UNIT - III: (12 hours)

Length of the perpendicular-Joint equation of two planes–Orthogonal projection on a plane - Volume of a tetrahedron.

(Chapter 2: Sec: 2.7, 2.8, 2.9, 2.10)

UNIT - IV: (12 hours)

Representation of line–angle between a line and a plane – co – planar lines–shortest distance between two skew lines –length of the perpendicular–intersection of three planes.

(Chapter 3: Sec: 3.1, 3.2, 3.4, 3.6, 3.7, 3.8)

UNIT - V: (12 hours)

Equation of a sphere-general equation of a sphere- sphere through four given points- plane section of two sphere- intersection of two spheres- sphere with given diameter – sphere through given circle- Angle of intersection of two spheres- condition for the orthogonality.

(Chapter 6: Sec: 6.1, 6.2, 6.3, 6.4, 6.7)

Activity:

- Understand and visualize angles between lines and planes.
- Solve problems involving lengths of perpendiculars from a point to a plane.

- Visualize geometric relationships between lines and planes.
- Visualize and interpret 3D structures of spheres.

Text Books:

1. Shanti Narayan and Mittal P.K., Analytical Solid Geometry, S Chand Publishing, 2021.

Reference Books:

1. Robert J. T. Bell, Co-ordinate Geometry of Three Dimensions
2. William F. Osgood and William C. Graustein, Plane and Solid Analytic Geometry, Macmillan Company, New York, 2016.
3. Robert C. Yates, Analytic Geometry with Calculus, Prentice Hall, Inc., New York, 1961.
4. S. L. Loney, Co-ordinate Geometry.
5. G.B. Thomas and R. L. Finny, Calculus and Analytical Geometry, Pearson Publication, 9th Edition, 2010.

E-learning Resources:

- https://www.google.com/search?q=nptel+analytical+geometry&oq=nptel+analytical+geometry&gs_lcrp=EgZjaHJvbWUyBggAEEUYOTIHCAEQIRiPAjIHCAIQIRiPAiBCDc5NDNqMGoxqAIAAsAIB&sourceid=chrome&ie=UTF8#fpstate=ive&vld=cid:39f73d3f,vid:BzxvLSkrd90,st:0

INTEGRAL CALCULUS AND VECTOR CALCULUS

(Course Code: 26UMTC22)

Semester - II

Core -T4

Hours - 4

Credits - 4

Course Outcomes: By the end of the course students will be able to

- CO1** Evaluate definite integrals using techniques such as integration by parts, reduction formulae, and limits of sums. (K3)
- CO2** Compute and apply double and triple integrals to find areas and volumes, and analyze Beta and Gamma functions. (K4)
- CO3** Perform vector algebra operations and differentiate vector functions. (K3)
- CO4** Determine gradient, divergence, and curl of vector fields and interpret their physical significance. (K4)
- CO5** Evaluate line and surface integrals for given scalar and vector fields. (K3)
- CO6** Apply Green's, Gauss's, and Stokes' theorems to solve problems in mathematics and physics. (K5)

UNIT - I: (12 hours)

Evaluation of Definite Integral - Integration by parts - Reduction formulae

(Text Book 1: Chapter 2: Sections 2.6 – 2.8)

UNIT - II: (12 hours)

Double and Triple integrals - Beta and Gamma functions.

(Text Book 1: Chapters 3 and 4: Sections 3.1 – 3.3 and 4.1)

UNIT - III: (12 hours)

Vector algebra - Differentiation of vectors – Gradient

(Text Book 2: Chapter 5: Sections 5.1 - 5.3)

UNIT - IV: (12 hours)

Divergence and Curl - Line integrals - Surface integrals

(Text Book 2: Chapter 5 : 5.4 ,Chapter 7: Sections 7.1 – 7.2)

UNIT - V: (12 hours)

Theorems of Green, Gauss and Stokes

(Text Book 2: Chapter 7: Section 7.3)

Activity:

1. Compute the area using GeoGebra integral tool.
2. Visualization of vector fields, gradient, divergence, and curl using GeoGebra.
3. Problems on finding area of regions and changing the order of integration in double integrals.

Text book:

1. S. Arumugam and A. Thangapandi Isaac, Calculus, New Gamma Publishing House, 2014.
2. S. Arumugam and Thangapandi Isaac, Analytical Geometry 3D and Vector Calculus, New Gamma Publishing House, 2011.

Reference books:

1. S. Narayanan, T. K. Manicavachagom Pillay, Calculus Volume II (Ananda Book Depot) PVT. LTD, 2016.
2. D. Chatterjee, Integral Calculus and Differential Equations, Tata-McGraw Hill Publishing Company Ltd.

E-Learning Sources:

1. https://onlinecourses.nptel.ac.in/noc20_ma07/preview
2. <https://elearn.nptel.ac.in/shop/iit-workshops/ongoing/mathematics/introduction-to-vector-calculus/?v=13b5bfe96f3e>
3. <https://nptel.ac.in/courses/111106146>

ALLIED PHYSICS – II

(Sub Code: 26UPHE21)

Semester – II EC – T2 Hours – 4 Credits – 3 Total Hours: 60

OBJECTIVE

To provide fundamental knowledge in electricity, magnetism, optics, electronics, and relativity, enabling students of Mathematics to understand the basic physical principles underlying modern science and technology.

Course Outcomes: By the end of the course the students will be able to

- CO1** Understand the basic principles of electricity, electric field, and electrostatic potential. (K2)
- CO2** Apply the laws of optics and electromagnetic waves in practical and theoretical (K3)
- CO3** Develop knowledge of basic electronic circuits, diodes, transistors, and oscillators. (K3)
- CO4** Understand the fundamental concepts of special theory of relativity and its physical implications. (K2)
- CO5** Analyze amplifier and oscillator circuits and explain their working principles. (K4)

UNIT – I: Electrostatics (12 Hours)

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

UNIT – II: Alternating Current and Electromagnetism (12 Hours)

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

UNIT – III: Electronics (12 Hours)

Junction diode – biasing – PN junction diode equation – V-I characteristics – Zener diode – applications – voltage regulator – junction transistor – voltage divider biasing – transistor amplifier – CE configuration – feedback principle – Barkhausen criterion – Colpitts oscillator.

UNIT – IV: Optics (12 Hours)

Interference – air wedge – Newton's rings – diffraction – plane transmission grating – determination of wavelength of monochromatic light – polarization – double refraction – Nicol prism – production of plane, circular and elliptical polarized light.

Frame of reference – Galilean transformation – Michelson–Morley experiment – special theory of relativity – Lorentz transformation – 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, Indira Publications, First Edition.

REFERENCE BOOKS

1. N. Sundararajan, George Thomas and Syed Azeez, College Physics, Vol. II, United Publishers, 2009.
2. N. Sundararajan, George Thomas and Syed Azeez, College Physics, Vol. III, United Publishers, 2009.
3. A. Ubald Raj and G. Jose Robin, Relativity, Wave Mechanics and Nuclear Physics, Indira Publications, First Edition, 2009.
4. N. Subramanyam, Brijlal and M. N. Avadhanulu, A Textbook of Optics, S. Chand & Company Ltd., 23rd Edition, 2006.

ALLIED PHYSICS – II (PRACTICAL)

(Sub Code: 26UPHE22)

Semester – II EC – P2 Hours – 2 Credits – 2 Total Hours: 30

LIST OF EXPERIMENTS

1. Grating – Oblique Incidence Method
2. Air Wedge – Determination of Thickness of Wire
3. LCR Series Resonance Circuit
4. LCR Parallel Resonance Circuit
5. Newton's Rings – Determination of Wavelength of Light
6. Zener Diode Characteristics
7. Diode Rectifier – Study of Characteristics
8. Spectrometer – Grating (Normal Incidence Method)
9. Spectrometer – Prism – Determination of Refractive Index of Glass
10. Focal Length of Convex Lenses – Combination (Contact and Non-contact Methods)

MATHEMATICS FOR COMPETITIVE EXAMINATIONS (NME)

(Course Code: 26UMTN21)

Semester - II

SEC - 2

Hours - 2

Credits - 2

Course Outcomes: By the end of the course the student will be able to

- CO1** Explain the concept of coding and decoding (K2)
- CO2** Explain the concept of blood relation (K2)
- CO3** Analyze the given series of data (K4)
- CO4** Select the figures to complete given pattern (K5)
- CO5** Describe the figures to complete given pattern (K1)
- CO6** Develop the competency to face competitive examinations (K6)

Eligibility: All UG students except those from the Department of Mathematics

UNIT- I: (6 hours)

Series Completion – Analogy - Classification

(Part I & Section I: Chapters 1, 2 and 3)

UNIT- II: (6 hours)

Coding-Decoding - Mathematical Operations.

(Part I & Section I: Chapters 4 and 13)

UNIT- III: (6 hours)

Blood Relations - Direction Sense Test - Logical Venn Diagram.

(Part I & Section I: Chapters 5, 8 and 9)

UNIT- IV: (6 hours)

Series - Analogy – Classification..

(Part II: Chapters 1, 2 and 3)

UNIT- V: (6 hours)

Spotting out the embedded figures - Completion of Incomplete Pattern- Figure matrix- cubes and dice.

(Part II : Chapter 7, 8 , 9, 14)

Text book:

1. Dr. R.S. Aggarwal, A modern approach to verbal and non-verbal reasoning, S. Chand and Company Ltd, Ram Nagar, New Delhi.

Reference book:

J. K. Chopra, Reasoning and Aptitude test, Unique Publishers, 2012.

E-Learning Resources:

- <https://nptel.ac.in/>
- <https://www.geeksforgeeks.org/quantitative-aptitude/>
- <https://www.khanacademy.org/math>
- <https://wpassets.adda247.com/wp-content/uploads/multisite/sites/2/2023/02/28172738/100-Reasoning-Questions-With-Solutions-for-SSC-CGL-Tier-2-Exam.pdf>

QUESTION PATTERN**Internal Assessment (CIA)**

Part A	Answer All: 15 objective-type Questions $\times$ 1 mark = 15 marks
Part B	Answer 10 Short Questions (out of 12) $\times$ 2 marks = 20 marks
Total Marks	35

Semester Examination

Total Number of Questions	60 (12 Objective-Type Questions for Each Unit)
Answer	50 Questions $\times$ 2 marks = 100 marks
Total Marks	100

SEQUENCES AND SERIES

(Course Code: 26UMTC31)

Semester - III

Core – T5

Hours - 5

Credits - 5

Course Outcomes: By the end of the course, the students will be able to:

- CO1** Define basic concepts of inequalities, sequences, and infinite series. **(K1)**
- CO2** Explain the properties of sequences, limits, and convergence using appropriate definitions and theorems. **(K2)**
- CO3** Apply standard tests to determine the convergence or divergence of sequences and series. **(K3)**
- CO4** Analyze the behavior of sequences and series using monotonicity, subsequences, limit points, and convergence tests. **(K4)**
- CO5** Evaluate the validity of inequalities and convergence of series using suitable mathematical criteria. **(K5)**
- CO6** Formulate and solve mathematical problems involving inequalities, sequences, and series. **(K6)**

Unit I: (15 hours)

Triangle inequalities – the arithmetic geometric and harmonic means - Cauchy - Schwarz inequality – some more inequalities.

(Chapter 2: Sections 2.2-2.5)

Unit II: (15 hours)

Sequences - bounded sequences - monotonic sequences - convergent sequences - divergent and oscillating sequences - the algebra of limits.

(Chapter 3: Sections 3.1 - 3.6)

Unit III: (15 hours)

Behaviour of monotonic sequences - some theorems on limits - subsequences - limit points - Cauchy sequences - the upper and lower limits of a sequence.

(Chapter 3: Sections 3.7 - 3.12)

Unit IV: (15 hours)

Infinite series - comparison test - D'Alembert's ratio test (without proof) - root test and condensation test - integral test.

(Chapter 4: Sections 4.1, 4.2, 4.4 and 4.5)

Unit V: (15 hours)

Alternating series - absolute convergence - test for convergence of series of arbitrary terms - multiplication of series - power series.

(Chapter 5: Sections 5.1- 5.3, 5.5 and 5.6)

Activities:

1. Proof and reasoning workshop on inequalities, sequences, limits, and Cauchy sequences.
2. Classification and analysis task for sequences and series using appropriate convergence tests.

Text book:

S. Arumugam and A. Thangapandi Issac, Sequences and Series, New gamma publishing House, Palayamkottai, 2017.

Reference books:

1. Ajit Kumar and S. Kumaresan, Real Analysis, second Indian reprint, CRC Press, 2015.
2. S.C Malik, Principles of Real Analysis, first edition, New Age International Private Limited.

E-Learning Source:

1. https://www.cimt.org.uk/projects/mepres/alevel/pure_ch13.pdf
2. https://www3.nd.edu/~lnicolae/Hon_Calc_Lectures.pdf
3. <https://people.math.osu.edu/fowler.291/sequences-and-series.pdf>

DIFFERENTIAL EQUATIONS, LAPLACE TRANSFORMS AND

FOURIER SERIES

(Course Code: 26UMTC32)

Semester -III

Core - T6

Hours - 5

Credits -4

Course Outcomes: By the end of the course the student will be able to

- CO1** Apply appropriate methods to solve linear differential equations with constant coefficients by determining complementary functions and particular integrals. (K3)
- CO2** Analyze and solve linear differential equations with variable coefficients using the method of variation of parameters and solve simultaneous linear differential equations. (K4)
- CO3** Form and solve first-order partial differential equations using standard methods. (K3)
- CO4** Evaluate and select appropriate methods, including Charpit's method, to obtain complete and particular integrals of first-order partial differential equations. (K5)
- CO5** Analyze the properties and applications of Laplace transforms, including inverse transforms and transforms of periodic functions, in solving differential equations. (K4)
- CO6** Construct and develop appropriate half-range Fourier cosine and sine series representations for given functions and interpret their significance in mathematical modeling. (K6)

Unit - I: (15 Hours)

Linear equations with constant coefficients - methods of finding complementary functions - methods of finding particular integrals.

(Text Book 1: Chapter 2: Sections 2.1 - 2.4)

Unit – II: (15 Hours)

Linear equation with variable coefficients (Type-D method of variation of parameters only) - simultaneous linear differential equations.

(Text Book 1: Chapter 2: Sections 2.5, 2.6)

Unit - III: (15 Hours)

Formation of partial differential equations - first order partial differential equations - methods of solving first order p.d.e – some standard forms - Charpit's method.

(Text Book 1: Chapter 4: Sections 4.1 - 4.5)

UNIT - IV: (15 Hours)

Definition - sufficient conditions for the existence of the Laplace transform – Laplace transform of periodic functions - some general theorems - the inverse transforms.

(Text Book 2: Chapter 5: Sections 5.1- 5.7)

UNIT - V:**(15 Hours)**

Definition - even and odd functions - half- range Fourier series - development in cosine series - development in sine series.

(Text Book 2: Chapter 6: Sections 6.1 – 6.5)

Text Books:

1. Dr. S. Arumugam and Thangapandi Issac, Differential Equation and Applications, Publishing House, 2011.
2. S. Narayanan and T.K. Manicka Vachagam Pillay, Calculus (Volume III), S. Viswanthan Publishers Pvt., Ltd., Chennai, 2010.

Reference books:

1. Richard Bronson and Gabriel B. Costa, Differential equations (fourth edition), McGraw Hill education, 2014.
2. N.P. Balli, Differential Equation (Golden Math series), Firewall media, 2015.
3. Joel L. Schiff, The Laplace Transform (Theory and applications), Springer, 1999.

E- LEARNING SOURCE:

- <https://www.open.edu/openlearn/science-maths-technology/introduction-differential-equations/content-section-0?active-tab=description-tab>

STATISTICS AND SPREAD SHEET ANALYSIS

(Course Code: 26UMTE31)

Semester - III

EC - T3

Hours - 4

Credits - 4

Course Outcomes: By the end of the course the student will be able to:

- CO1** Explain the concepts of random variables, distribution functions, and distinguish between discrete and continuous probability distributions.(K2).
- CO2** Compute mathematical expectation, variance, and covariance, and apply their properties to solve problems involving random variables. (K3).
- CO3** Evaluate moment generating functions and use them to determine moments and related characteristics of probability distributions. (K3).
- CO4** Analyze and solve problems using discrete probability models such as Binomial and Poisson distributions, including derivation of recurrence relations for moments.(K4).
- CO5** Analyze continuous probability models including Normal, Gamma, and Exponential distributions and apply them to real-life statistical problems.(K4).
- CO6** Apply spreadsheet tools and functions to organize data, perform statistical computations, and present results effectively through proper spreadsheet design and formatting. (K3)

UNIT - I: (12 hours)

Random variable - Distribution function - Discrete random variable - Continuous random variable .

(Book 1-Chapter 5: Section 5.1 - 5.5 (Except 5.5.6-5.5.7))

UNIT - II: (12 hours)

Mathematical expectation – Expected value of function of a random variable – Properties of expectation – Properties of variance - Covariance.

(Book 1-Chapter 6: Section 6.2 - 6.6.)

UNIT - III: (12 hours)

Moment generating function. - Binomial distribution - Poisson distribution ((Derivation only for Recurrence relation for the moments).)

(Book 1-Chapter 7: Section 7.1 & Chapter 8: Section 8.4(Except 8.4.3, 8.4.10-8.4.12), 8.5 and 8.7)

UNIT - IV: (12 hours)

Normal distribution - Gamma distribution – Exponential distribution ((Derivation only for Recurrence relation for the moments).)

(Book 1-Chapter 9: Section 9.2 (Except 9.2.11-9.2.15), 9.8)

UNIT - V: (12 hours)

Introduction to Spreadsheet Analysis - Basic Functions and Formulas - Spreadsheet Design - Spreadsheet Formatting.

(E-Resources 1: Section 6.1 - 6.3)

Activity:

- Collect Problems based on JAM/NBHM/CUET Exams and solve.
- Create, format and Design spread sheet.

Textbook:

1. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11th edition, Sultan Chand and Sons, 1982.
2. <https://egyankosh.ac.in/bitstream/123456789/96408/1/UNIT-6.pdf>

References:

1. P.R. Vittal, Mathematical Statistics, Margham Publications, Chennai, 2004.
2. J.N. Kapur and H.C. Saxena. Mathematical Statistics 20th Edition, S. Chand & Co Ltd. New Delhi, 2010.
3. Michael Alexander and Richard Kusleika, Excel 2019 Bible
4. Ken Bluttman and Peter G. Aitken, Excel Formulas and Functions For Dummies\
5. Rob Collie and Avi Singh, Power Pivot and Power BI: The Excel User's Guide to DAX, Power Query, Power BI & Power Pivot in Excel 2010-2016.

E-Learning Resources:

- Excel Easy (<https://www.excel-easy.com/>)
- Exceljet (<https://exceljet.net/>)
- Excel Campus (<https://www.excelcampus.com/>).

FUNDAMENTALS OF POWER BI AND AI (PRACTICAL)

(Course Code: 26UMAS31)

Semester – III

SEC- 5

Hrs – 2

Credits - 2

Course Outcomes: By the end of the course the student will be able to

- CO1** Describe the functions and use of Power BI. (K1)
- CO2** Explain designing and building interactive visualizations using different chart types. (K2)
- CO3** Apply concepts learned in excel to create calculated columns and measures to perform advanced calculations. (K3)
- CO4** Combine multiple data sources using relationships to build robust data models. (K4)
- CO5** Publish and share reports securely with colleagues and stakeholders. (K5)
- CO6** Apply data visualization principles to effectively present insights. (K6)

List of Practicals

1. Covid Analysis
2. Exploratory Sales Analysis
3. Trading of Stocks
4. Weather Dashboard
5. Employee Attrition Dashboard
6. Sports – IPL Dashboard
7. Netflix Recommendations
8. Crop Production in Agriculture
9. Used Car Sales Analysis
10. Dashboard

Text Books

1. Microsoft Power BI cookbook, Brett Powell, Packt Publishing Limited, 2nd edition, 2017.

Reference Books

1. Greg Deckler, Brett Powell, Microsoft Power BI Cookbook: Gain expertise in Power BI, Packt Publishing Limited, 2nd Edition, 2021.

REAL ANALYSIS
(Course Code: 26UMTC41)

Semester - IV

Core – T7

Hours -6

Credits - 6

Course Outcomes: By the end of the course the student will be able to

- CO1** Analyse the topological and algebraic properties of real number system (K4)
- CO2** Discuss the concept of continuity and differentiability (K2)
- CO3** Apply the higher order derivatives (K3)
- CO4** Analyze the behavior of limit and series (K4)
- CO5** Analyze the relation between differentiation and integration (K4)
- CO6** Evaluate definite integrals (K5).

UNIT – I: (18 hours)

Algebra of the real number system – upper and lower bounds – l.u.b. property and its applications – absolute value and triangle inequality

(Chapter: 1)

UNIT – II: (18 hours)

Continuous functions - ε - δ definition of continuity – Intermediate value theorem – Extreme value theorem – monotone Functions.

(Chapter: 3: Sections 3.1-3.5)

UNIT – III: (18 hours)

Limits - uniform continuity – differentiability of functions - Mean value theorem – L’ Hospital’s rule (statement only).

(Chapter: 3: Sections 3.6-3.7, Chapter 4: Sections 4.1- 4.2)

UNIT – IV: (18 hours)

Higher order derivatives – Taylor’s theorem – Darboux integrability – properties of the integral.

(Chapter 4: Sections 4.4 - 4.5, Chapter 6: Sections 6.1- 6.2)

UNIT – V: (18 hours)

Fundamental theorem of Calculus - Mean value theorem for integrals – Riemann’s definition – Sum of an infinite series as an integral.

(Chapter 6: Sections 6.3, 6.4, 6.6 and 6.7)

Activity:

Problems on applying the fundamental theorem of calculus, exploring the mean value theorem for integrals, approximate the sum of an infinite series using an integral.

Text Book:

Ajith Kumar and S. Kumaresan, A basic course in Real Analysis, Second Indian Reprint, CRC Press, 2016.

Reference Books:

1. S.C Malik, Principles of Real Analysis, first edition, New Age International Private Limited, 2017
2. Robert G. Bartle, Donald R. Sherbert, Principles of Real Analysis, first edition, New Age International Private Limited, 2014

E- Learning Resources:

- <https://nptel.ac.in/courses/111104108>
- <https://nptel.ac.in/courses/111106133>
- <https://nptel.ac.in/courses/111104107>
- <https://nptel.ac.in/courses/111104106>

ADVANCED STATISTICS

(Course Code: 26UMTE41)

Semester - III

EC – T4

Hours - 6

Credits - 6

Course Outcomes: By the end of the course the student will be able to

CO1 Interpret the concept of correlation coefficients (K2)

CO2 Discuss the various types of sampling (K2)

CO3 Explain the procedure for testing of hypothesis (K2)

CO4 Describe the applications of t and F distributions (K2)

CO5 Demonstrate the use of the chi-square distribution (K3)

CO6 Analyze the types of estimators (K4)

UNIT - I:

(18 hours)

Introduction – Meaning of Correlation – Scatter diagram – Karl Pearson's Coefficient of Correlation – Rank Correlation. (Chapter 10: Section: 10.1 - 10.4, 10.7)

UNIT - II:

(18 hours)

Introduction - Types of Sampling - Parameter and Statistic - Tests of significance - Procedure for testing of hypothesis - Test of significance for large samples - Sampling of attributes – Sampling of variables. (Chapter 14)

UNIT - III:

(18 hours)

Introduction – Derivation of the chi-square distribution – MGF of chi-square distribution - Applications of chi-square distribution.

(Chapter 15: Section 15.1- 15.3, 15.6 (Except 15.6.4-15.6.7))

UNIT - IV:

(18 hours)

Introduction – Student's t- distribution - Applications of t-distribution – Distribution of sample correlation coefficient when population correlation coefficient is zero- F-distribution - Applications of F-distribution. (Chapter 16: Section 16.1-16.6)

UNIT - V:

(18 hours)

Introduction - Characteristics of estimators – Unbiasedness - Consistency - Efficient and Most Efficient Estimators – Methods of Estimation - MLE (statement of properties and direct simple problems, no theorems).

(Chapter 17: Section 17.1-17.2 (Except MVU Estimators and 17.2.4), 17.6 (Except 17.6.2 - 17.6.4))

Textbook:

1. S. C. Gupta and V. K. Kapoor, Fundamentals of Mathematical Statistics, 11th edition, Sultan Chand and Sons, 1982.

References:

1. P. R. Vittal, Mathematical Statistics, Margham Publications, Chennai, 2004.
2. J.N. Kapur and H.C. Saxena. Mathematical Statistics 20th Edition, S. Chand & Co Ltd. New Delhi, 2010.

E-Learning Resources

- <https://nptel.ac.in/courses/111/106/111106150/>
- <https://nptel.ac.in/courses/111/104/111104098/>
- [https://math.libretexts.org/Bookshelves/Probability_and_Statistics/Book%3A_Mathematical_Statistics_\(Mendes-da-Costa\)](https://math.libretexts.org/Bookshelves/Probability_and_Statistics/Book%3A_Mathematical_Statistics_(Mendes-da-Costa))

Learning Activities:

- Hands-on numerical problem solving for correlation, t , χ^2 , and F tests
- Mini-projects using real-world datasets (education, health, business)

DISCRETE MATHEMATICS

(Course Code: 26UMTE42)

Semester - IV

EC – T5

Hours - 4

Credits - 4

Course Outcomes: By the end of the course the student will be able to

- CO1** Identify the applications of Pascal's triangle (K1)
- CO2** Summarize the combinatorial tools (K2)
- CO3** Discuss the Euclidean Algorithm (K2)
- CO4** Use combinatorial concepts in Computer Applications (K3)
- CO5** Argue the laws of large and small numbers (K5)
- CO6** Compare number theory and combinatorics (K5)

UNIT - I: (12 Hours)

Combinatorial tools –induction - comparing and estimating numbers - inclusion-exclusion.

(Chapter 2: Sections 2.1 – 2.3 and 2.4)

UNIT - II: (12 Hours)

Binomial Coefficients - the binomial theorem - Pascal's triangle - identities in Pascal's triangle.

(Chapter 3: Sections 3.1, 3.5-3.6)

UNIT - III: (12 Hours)

Fibonacci Numbers – Fibonacci's exercise - Lots of Identities - a formula for the Fibonacci numbers - combinatorial probability - the law of large Numbers - the law of small numbers.

(Chapter: 4, Chapter 5: Sections 5.3 and 5.4)

UNIT - IV: (12 Hours)

Integers - divisors and primes - divisibility of integers – primes - factorization into primes.

(Chapter 6: Sections 6.1- 6.3)

UNIT - V: (12 Hours)

Fermat's little theorem - The Euclidean Algorithm – congruences - number theory and Combinatorics

(Chapter 6: Sections 6.5, 6.6, 6.7 and 6.9)

Text book:

L. Lovasz, J. Pelikan, K. Vesztergombi, Discrete Mathematics - Elementary and Beyond, Springer-Verlag, New Delhi, 2003.

Reference books:

1. Richard Johnsonbaugh, Discrete Mathematics, sixth edition, Pearson, 2008.
2. Seymour Lipschutz, Marc Laras Lipson, Varsha H. Patil, Discrete Mathematics, Schaum's outline series, 2017.

ASTRONOMY

(Course Code: 26UMTE42)

Semester –IV

EC – T5

Hours – 4

Credits - 4

Course outcomes: By the end of the course the students will be able to

CO1 Recall the celestial bodies and celestial coordinates (K1)

CO2 Describe Kepler's laws (K2)

CO3 Associate the solar and lunar eclipses (K2)

CO4 Apply the Kepler's laws in Newton deductions (K3)

CO5 Analyze the seasons and calendar (K4)

CO6 Build the knowledge of astro-physics (K6).

UNIT - I:

(12 hours)

Celestial sphere - celestialco-ordinates - sidereal time - latitude of place - hour angle at rising - diurnal motion – duration of day time.

(Art: 39 - 77)

UNIT - II:

(12 hours)

Morning and evening stars - circumpolar stars - time taken by a star to rise. The Earth - zones of the earth - perpetual day - Analytical condition – twilight.

(Art: 80 - 83, 86 - 90, 111 – 114. 116)

UNIT - III:

(12 hours)

Refraction - tangent formula – Cassini's formula - horizontal refraction - geocentric parallax - horizontal parallax of moon.

(Art: 117 - 129, 131, 135 -136, 139 - 144)

UNIT - IV:

(12 hours)

Kepler's laws – anomalies - Kepler's Equation – seasons – calendar.

(Art: 146 - 149, 156 – 159, 173 – 179)

UNIT - V:

(12 hours)

The moon - phases of moon - Eclipses - lunar and solar eclipses maximum and minimum eclipses in a year-Aryabhata's contribution in astronomy (Eclipses only, Reference- e -source).

(Art: 229 - 241, 253, 256 – 263, 267, 268, 271 – 275)

Assignment: Zones of earth and phases of Moon, Night sky observation chart.

Text book:

1. S. Kumaravelu and Susheela Kumaravelu, Astronomy, Janki Calendar Corporation, Sivakasi,

2012.

2. https://www.google.com/url?sa=t&source=web&rct=j&opi=89978449&url=https://vajiramandravi.com/upsceexam/aryabhata/&ved=2ahUKEwjL2qqD7rqSAxXLSGwGHWIRLFwQFn_oECCAQAQ&usg=AOvVaw1OJXTXpeMd78rL4HNZMy3f

Reference books:

1. S.K.Sharma, R.K. Gupta and Dharendra Kumar, Spherical Astronomy, Krishna Prakashan Media (P) Ltd, Meerut, 2014.
2. W M Smart, A Text Book on Spherical Astronomy, 6th edition, revised by R.M.

COMBINATORICS

(Course Code: 26UMTE42)

Semester - IV

EC -T5

Hours - 4

Credits – 4

Course Outcomes: By the end of the course the students will be able to

- CO1** Understand power series solutions of first and second order ordinary differential equations and analyze their properties. (K2)
- CO2** Apply the method of Frobenius to solve linear second order differential equations with regular singular points.(K3)
- CO3** Analyze special functions such as Bessel functions and Legendre polynomials and examine their properties.(K4)
- CO4** Solve boundary value problems involving special functions arising in physical applications. (K3)
- CO5** Evaluate and interpret the role of special functions in applications such as Quantum Mechanics and Electrostatics. (K5)
- CO6** Construct generating functions and derive recurrence relations for special functions and interpret their mathematical significance. (K6)

UNIT I: (12 Hours)

Basic Combinatorial numbers – Stirling numbers of the second kind.

UNIT II: (12 Hours)

Generating functions and Recurrence relations – Symmetric functions.

UNIT III: (12 Hours)

Multinomials – multinomial theorem – Inclusion and Exclusion principle.

UNIT IV: (12 Hours)

Euler Function – Permutations with forbidden positions – The ‘Menage’ problem – Problem on Fibonacci.

UNIT V: (12 Hours)

Polya Theory – Necklace problem and Burnside’s lemma – Cycle index of a permutation group – Polya’s theorems and their immediate applications.

Text Books:

1. Krishnamurthy, V., Combinatorics Theory and Applications, East-West Press.

Reference Books:

1. V.K. Balakrishnan – Theory and Problems of Combinatorics – Schaum’s Outline Series – McGraw Hill.
2. Ian Anderson – Combinatorics of Finite Sets – Oxford Science Publication.
3. Kenneth P. Bogart – Introductory Combinatorics – Pitman Books L

ABSTRACT ALGEBRA
(Course Code: 26UMTC51)

Semester – V **Core – T8** **Hours - 6** **Credits –5**

Course Outcomes: By the end of the course the student will be able to

- CO1** Describe the fundamental concepts of groups, rings, and fields (K1)
- CO2** Explain cosets, homomorphisms, isomorphisms and automorphisms (K2)
- CO3** Demonstrate subgroup, normal subgroup and quotient group and apply Lagrange's theorem (K3)
- CO4** Analyze Integral domain and Euclidean domain (K4)
- CO5** Categorize integral domain using unique factorization theorem (K4)
- CO6** Interpret Gaussian integers along with their algebraic properties (K2)

UNIT - I: (18 hours)
Groups and subgroups - Simple properties - Cyclic groups - Cosets and Lagrange's theorem.
(Chapter 2: Sections 2.1 - 2.2, Sections 2.4 – 2.6)

UNIT - II: (18 hours)
Normal subgroups - Quotient groups – Homomorphism – Isomorphism.
(Chapter 2: Sections 2.7 - 2.9)

UNIT – III: (18 hours)
Automorphisms - Permutation groups - Definition and properties of rings - Special classes of rings
(Chapter 2: Sections 2.10 - 2.11, Chapter 3: Sections 3.1 -3.3)

UNIT – IV: (18 hours)
Subrings and subfields - Ideals and Quotient rings – Homomorphisms - Maximal and Prime ideals.
(Chapter 3: Sections 3.4 - 3.7)

UNIT – V: (18 hours)
The Characteristic of an Integral domain - Definition and properties of Euclidean domain -
The Unique Factorization theorem – Gaussian integers.
(Chapter 3: Section 3.8, Chapter 4: Sections 4.1 - 4.3)

Activity:

Execute manually or using computational tool like Python or Magma the following:

1. Normal Test: Select a non-abelian group of small order and identify which subgroups are normal by checking if their left and right cosets coincide.
2. Cayley's Theorem in Action: Take a small cyclic group and represent every element as a permutation.
3. Analyze the ring $\mathbb{Z}[x]$ or $\mathbb{Z}_n[x]$: In that ring, find a prime ideal but not a maximal ideal.
4. The Euclidean Algorithm: Pick two complex numbers and perform the Euclidean Algorithm to find their greatest common divisor.

Text Book:

M.L. Santiago, Modern Algebra, Tata McGraw Hill Publishing Company Ltd, New Delhi, 2001.

Reference books:

1. S. Arumugam, A.T. Issac, Modern Algebra, Scitech publishers, 2015.
2. Vijay K. Khanna, S. K. Bhambri, A Course in Abstract Algebra, Fifth edition, Vikas publishing house private limited, 2016.
3. Sharma. J.N. and A.R. Vashistha – “Linear Algebra”, Krishna Prakash Media(P) Ltd, 2022.
4. John B. Fraleigh, A First Course in Abstract Algebra, 7th Ed., Pearson, 2002.

E-learning Resources:

1. <https://nptel.ac.in/courses/111106113>
2. <https://nptel.ac.in/courses/111106131>
3. <https://nptel.ac.in/courses/106104149>
4. <https://www.google.com/search?q=https://ocw.mit.edu/courses/18-701-algebra-i/>
5. <https://ocw.mit.edu/courses/18-703-modern-algebra-spring-2013/>
6. <https://www.coursera.org/specializations/algebra-elementary-to-advanced>
7. <https://www.edx.org/learn/algebra>

MODERN ANALYSIS
(Course Code: 26UMTC52)

Semester - V Core - T9 Hours - 6 Credits - 4

Course Outcomes: By the end of the course the student will be able to

- CO1** Differentiate countable and uncountable sets (K2)
- CO2** Discuss the properties related to connected set and compact spaces (K2)
- CO3** Associate the concepts learnt in real line and metric space (K2)
- CO4** Illustrate the properties of complete set (K4)
- CO5** Derive various concepts in topology (K6)
- CO6** Develop the related concepts in advanced analysis (K6)

UNIT – I: (18 hours)

Countable Sets - uncountable sets - metric space - definition and examples - bounded sets in a metric space - open ball- open sets.

(Chapter 1: Sections 1.2 and 1.3, Chapter 2: Sections 2.1- 2.4)

UNIT – II: (18 hours)

Subspaces - interior of a set - closed sets – closure - limit point - dense sets.

(Chapter 2: Sections 2.5-2.10)

UNIT – III: (18 hours)

Complete metric space – completeness - Baire's category theorem - continuity – homeomorphism - uniform continuity.

(Chapter 3: Section 3.1 and 3.2, Chapter 4: Sections 4.1 - 4.3)

UNIT – IV: (18 hours)

Connectedness - definition and examples - connected subsets of $\mathbb{R}$ - connectedness and continuity

(Chapter 5: Sections 5.1 - 5.3)

UNIT – V: (18 hours)

Compactness - compact space - compact subsets of $\mathbb{R}$ - equivalent characterization for compactness - compactness and continuity

(Chapter 6: Sections 6.1 - 6.4)

Activity :

- 1) Problem solving sessions: Identify whether given sets are countable or uncountable.
- 2) Use SCILAB to graphically represent closure and limit points.

Text book:

Dr. S. Arumugam and Mr. A. Thangapandi Issac, Modern Analysis, New Gamma Publishing House, Palayamkottai, 2007.

Reference books:

1. Narayanan Shanti, Mittal P. K., A Course of Mathematical Analysis, S. Chand publishing company, 2005.

2. S. Kumaresan, Topology of metric space, Second edition, Narosa publication, 2011.

E- Learning Resources:

1. <https://epgp.inflibnet.ac.in/Home/ViewSubject?atid=ZLCHeZEhCZ8yCri36nSF3A==>
2. https://youtube.com/playlist?list=PLbJCOW-02l3--KOg_Z-aCn6UwzB8RSPgc&si=QtkY4AFYOe0fEjE7

GRAPH THEORY

(Course Code: 26UMTC53)

Semester - V

Core – T10

Hours - 5

Credits - 4

Course Outcomes: By the end of the course the students will be able to

CO 1. Recall the basic definitions, terminology and types of graphs including degrees(K1)

CO 2. Explain the concepts of bridges, spanning trees, cut vertices and connectivity (K2)

CO 3. Illustrate the Euler and the Hamiltonian graphs and matching in graphs(K3)

CO 4. Apply Euler's formula to plane and planar graphs and explain then dual graphs (K3)

CO 5. Analyze vertex colouring, critical graphs and edge colouring techniques. (K4)

CO 6. Solve practical and real-life problems using paths, connectivity and colouring (K6)

UNIT - I: (15 hours)

The definition of a graph - more definitions - vertex degree - sub graphs - paths and cycles
(Chapter 1: Sections 1.1, 1.3 – 1.6)

UNIT - II: (15 hours)

Definitions and simple properties - bridges - spanning trees – cut vertices and connectivity.
(Chapter 2: Sections 2.1 - 2.3 and 2.6)

UNIT - III: (15 hours)

Euler Tours - Hamiltonian graphs - matchings - augmenting paths
(Chapter 3: Sections 3.1, 3.3, (Omit Fleury's algorithm and Theorem 3.5),
Chapter 4: Sections 4.1)

UNIT - IV: (15 hours)

Plane and planar graphs - Euler's Formula - the dual of a plane graph.
(Chapter 5: Sections 5.1, 5.2 and 5.6)

UNIT - V: (15 hours)

Vertex colouring - critical graphs - edge colouring
(Chapter 6: Sections 6.1, 6.3 and 6.5 (Omit Theorems 6.5 and 6.14)

Activity:

- Model the college campus as a graph by representing locations as vertices and connecting routes as edges and then identify paths, cycles, cut vertices, bridges and construct a spanning tree for the graph.
- Apply vertex colouring or edge colouring techniques to solve practical problems such as timetable scheduling or map colouring, and determine the minimum number of colours required.

Text book:

John Clark, Derek Allan Holton, A First Look at Graph Theory, world scientific, 1991.

Reference books:

1. S. Arumugam and S. Ramachandran. Invitation to Graph Theory, 2006.
2. C. Vasudev, Graph Theory with Applications, 2006.

E- Learning Source:

1. https://www.pbsiddhartha.ac.in/LMS/eContent/Lecture_Notes_on_Graph_Theory.pdf
2. https://www.isibang.ac.in/~d.yogesh/Course_Notes/Graph_Theory_B2_Notes.pdf
3. <https://dpvipracollege.ac.in/wp-content/uploads/2026/01/Intro.-to-Graph-Theory.pdf>

PYTHON AND DATA ANALYSIS

(Course Code: 26UMTC54)

Semester - V

Core – T11

Hours - 4

Credits – 3

Course Outcomes: By the end of the course the students will be able to:

- CO1** Recall basic syntax rules, keywords, data types, operators, control statements, functions, data structures, and built-in features of **strings, tuples, and sets**(K1)
- CO2** Explain basic syntax, data types, operators, control structures, functions, data structures, and string special methods, sets and tuples in Python (K2)
- CO3** Apply Python constructs such as input/output operations, conditional statements, loops, functions, lists, tuples, set manipulation and string operations (K3)
- CO4** Implement Python programs integrating control flow, user-defined functions and data structures to solve real-world problems (K3)
- CO5** Analyze Python programs by evaluating control structures, function behavior, data structure selection and mutability (K4)
- CO6** Design and evaluate efficient Python applications using appropriate programming constructs, data structures and operator overloading (K5 &K6)

UNIT I:

(12 hours)

Writing a simple program - reading input from the Console - identifiers - variables, assignment statements and expression - simultaneous assignments - named constants - numeric data types and operators - evaluating expressions and operator precedence - augmented assignment operators - common python functions - strings and characters

(Chapter 2 & 3: 2.2 - 2.10, 3.2, 3.3(except 3.3.1-3.3.3))

UNIT - II:

(12 hours)

Introduction to objects and methods - formatting numbers and strings - Boolean types, values and expressions - generating random numbers - *if* statements - Two way *if-else* statement - nested if and multiway *if-elif- else* statements.

(Chapter 3 & 4: 3.5, 3.6, 4.2, 4.3,

UNIT - III:

(12 hours)

Logical operators - Conditional Expressions - operator precedence and associativity - the *while* loop - the *for* loop - nested loops - keywords *break* and *continue*.

(Chapter 4 & 5:4.11, 4.14, 4.15, 5.2, 5.3, 5.4, 5.7)

UNIT - IV:

(12 hours)

Defining a function - calling a function - functions with/without return values - positional and keyword arguments - passing arguments by reference values - default arguments - returning multiple values - list basics - copying lists- passing list to functions - returning lists from functions.

(Chapter 6 & 10: 6.2 - 6.6, 6.10, 6.11, 10.2, 10.6 - 10.8)

Strings and Special Methods – Str class - Operator Overloading and Special Methods Tuples
- sets - comparing functions.

(Chapter 8 & 14: 8.2, 8.3, 8.5 14.2 - 14.4, 14.6)

Text book:

Y. Daniel Lang, Introduction to Programming using Python, 2nd Edition, Pearson Education Inc., 2013.

Reference books:

1. Allen B. Downey, Think Python: How to Think Like a Computer Scientist, O'Reilly Media.
2. Mark Lutz, Learning Python, O'Reilly Media.
3. ReemaThareja, Python Programming Using Problem Solving Approach, Oxford University Press.
4. Al Sweigart, Automate the Boring Stuff with Python, No Starch Press.
5. Dr. R. Nageswara Rao, Core Python Programming, Second Edition, Dreamtech Press, 2018.
6. Wes McKinney, Python for Data Analysis, O'Reilly Media.

E-Learning Resource:

1. Python Official Documentation: <https://docs.python.org>
2. Python Tutorial - link:
https://www.tutorialspoint.com/ebook/python_tutorial/index.asp

PYTHON AND DATA ANALYSIS PRACTICAL

(Course Code: 26UMTC55)

Semester - V

Core –P3

Hours - 2

Credits -2

1. Simple programs to use input/output operations
2. Program using operators
3. Decision Making Programs
4. Programs using Loops
5. Programs String Manipulation
6. Programs using Lists
7. Programs using Tuples.
8. Programs using Functions

LINEAR PROGRAMMING AND GAME THEORY

(Course Code: 26 UMTE 51)

Semester - V

EC – T6

Hours - 5

Credits - 4

Course Outcomes: By the end of the course the student will be able to

CO1 Recall the simplex algorithm (K1)

CO2 Describe graphical solution method to solve LPP (K2)

CO3 Illustrate Big-M method and inverting a matrix (K3)

CO4 Apply Hungarian method to solve assignment problem (K3)

CO5 Outline MODI method to solve transportation problem (K4)

CO6 Design methods to solve $m \times n$ game (K6)

UNIT - I:

(15 hours)

Introduction - mathematical Formulation of the problem - Introduction - graphical solution method - some exceptional cases - general linear programming problem - canonical and standard forms of L.P.P.

(Chapter: 2, 3 (Sections 3.1 – 3.5))

UNIT - II:

(15 hours)

Introduction - fundamental properties of solutions (statement of the theorems and problems only) - the computational procedure - the simplex algorithm - use of artificial variables (BIG - M method only) - solutions of simultaneous linear equations – inverting a matrix using simplex method – applications of simplex method.

(Chapter 4)

UNIT - III:

(15 hours)

Introduction - general transportation - the transportation table - loops in transportation tables - solution of a transportation problem - finding an initial basic feasible solution - test for optimality - degeneracy in transportation problem - transportation algorithm (MODI method).

(Chapter 10: Sections 10.1 – 10.12)

UNIT - IV:

(15 hours)

Introduction - mathematical formulation of the problem - the Assignment method special cases - the travelling salesman problem.

(Chapter 11: Sections 11.1 – 11.4 and 11.6)

UNIT - V:

(15 hours)

Introduction - Two person zero - sum games - some basic terms - the maximin - minimax principle - games without saddle point - mixed strategies - graphical solution – dominance.

(Chapter 17: Sections 17.1 – 17.7)

Activity:

- Explore the applications of assignment problem in Job Scheduling, Exam Scheduling, Manufacturing and Production, Sports and Tournament Scheduling.

- Apply Travelling Salesman Problem concepts in Transportation and Route planning, Logistics and Delivery services.

Text book:

Operations Research, Kanti Swarup, P.K. Gupta and Man Mohan, Sultan Chand and Sons, New Delhi, 2006.

Reference books:

G. V. Shenoy, Linear Programming methods and Applications, second edition, New age International (p) limited, 2007.

OPERATIONS RESEARCH

(Course Code: 26 UMTE 51)

Semester - V

EC – T6

Hours - 5

Credits - 4

Course Outcomes: By the end of the course, the student will be able to

CO1 Recall various methods to solve a game (K1)

CO2 Describe dynamic programming to solve LPP (K2)

CO3 Illustrate replacement, recruitment and promotion problem (K3)

CO4 Outline techniques in calculus to solve inventory problem (K4)

CO5 Evaluate the methods of solving real time problems using network models by PERT/CPM (K5)

CO6 Design methods to solve managerial problems. (K6)

UNIT - I:

(15 hours)

Introduction –the recursive equation approach – characteristics of dynamic programming – dynamic programming algorithm – solution of discrete DPP – some applications - Solution of LPP by dynamic programming. (Chapter 13)

UNIT - II:

(15 hours)

Introduction – Two-Person Zero-Sum Games - some basic terms - the maximin and minimax principles - Games without saddle points - mixed strategies - graphic solution of $2 \times n$ and $m \times 2$ games - Dominance property.

(Chapter 17: Sections 17.1 - 17. 7)

UNIT - III:

(15 hours)

Introduction - replacement of equipment - asset that deteriorates gradually - replacement of equipment that fails suddenly - recruitment and promotion problem.

(Chapter 18: Sections 18.1 - 18. 4)

UNIT - IV:

(15 hours)

Introduction - the inventory decisions - costs associated with inventories - factors affecting inventory control - economic order quantity - deterministic inventory problems with no shortages - with shortages - EOQ problems with price breaks – multi item deterministic problems (solutions of inventory models are not for examination).

(Chapter 19: Sections 19.1 - 19.9)

UNIT - V:

(15 hours)

Introduction - network and basic components logical sequencing - rules of network constructions - critical path analysis - probability considerations in PERT - distinction between PERT and CPM. (Chapter 21)

Text book:

Kanti Swarup, P.K. Gupta and Manmohan, Operations Research, Ninth revised edition, Sultan Chand and Sons, New Delhi, 2001.

Reference books: Prem Kumar Gupta and D.S. Hira, Operations Research – An Introduction, S. Chand and Company Ltd., New Delhi, 2015.

NUMBER THEORY

(Course Code: 26 UMTE 51)

Semester - V

EC – T6

Hours - 5

Credits - 4

Course Outcomes: By the end of the course the student will be able to

- CO1** Describe the well-ordering principle and the Archimedean property (K1)
- CO2** Discuss division algorithm, Euclidean algorithm and their application (K2)
- CO3** Demonstrate fundamental theorem of arithmetic (K3)
- CO4** Analyze the basic properties of congruence (K4)
- CO5** Argue the divisibility tests and the linear congruence (K5)
- CO6** Test the primality of numbers by using Wilson's theorem (K5)

UNIT- I: (15 hours)

Contributions of Srinivasa Ramanujan to Number Theory- Well-ordering principle – Archimedean property – principle of finite induction – the binomial theorem.

(Text Book 1: Chapter P: Sections P4, P5 and P6, Text Book 2: Chapter 1)

UNIT- II: (15 hours)

The division algorithm – greatest common divisor – the Euclidean algorithm

(Text Book 2: Chapter 2)

UNIT- III: (15 hours)

The fundamental theorem of arithmetic – the Sieve of Eratosthenes – the Goldbach conjecture

(Text Book 2: Chapter 3)

UNIT- IV: (15 hours)

Basic properties of congruence - Ramanujan's Congruence – special divisibility tests – linear congruences

(Text Book 2: Chapter 4, Text Book 3 – Chapter 5: Section: 5.5)

UNIT- V: (15 hours)

Fermat's factorization theorem – the Little theorem – Wilson's theorem.

(Text Book 2: Chapter 5)

Skill-Oriented Content / Activities

- Proof writing using **induction**
- Concept mapping: Well-ordering $\leftrightarrow$ Induction
- Short presentation on **Ramanujan's contributions**
- Solving binomial coefficient identities
- Manual execution of **Euclidean Algorithm**
- Algorithmic problem solving
- Coding activity: GCD using Python/C (optional)
- Real-life application of GCD (scheduling, cryptography)

Text book:

1. S. R. Ranganathan, Ramanujan, the Man and the Mathematician, [Issue 1 of Great thinkers of India series](#), Asia Publishing House, 1967

2. David M. Burton, Elementary Number Theory, 4th edition, The McGraw-Hill Companies Inc., 1998.
3. George E. Andrews, Kimmo Erilsson, Integer Partitions, Cambridge University Press, 2004

Reference book:

S.B. Malik, Basic Number Theory, Vikas Publishing House PVT LTD, Reprint 2006.

E-Learning Resources

- NPTEL
- MIT OpenCourseWare
- Khan Academy:
- MacTutor (University of St Andrews):Srinivasa Ramanujan biography

LINEAR ALGEBRA AND LATTICES

(Course Code: 26UMTC61)

Semester - VI

Core – T12

Hours - 6

Credits - 4

Course Outcomes: By the end of the course the student will be able to

- CO1** Define the fundamental concepts of vector spaces, linear independence, and direct sums. (K1)
- CO2** Describe the notions of basis, dimension, homomorphism, and dual spaces in vector spaces. (K2)
- CO3** Compute inner products, eigenvalues, eigenvectors, and perform basic matrix operations. (K3)
- CO4** Analyze the rank of matrices, systems of linear equations, Hermitian, and UNITary transformations. (K4)
- CO5** Classify different types of lattices such as distributive, modular, and Boolean lattices. (K4)
- CO6** Interpret the relationships among vector spaces, linear transformations, and matrices in solving algebraic problems. (K5)

UNIT – I: (18 hours)

Vector spaces: Definition and simple properties - Subspaces and quotient spaces - Sums and direct sums - Linear independence.

(Text Book 1 - Chapter 6: Sections 6.1 - 6.4)

UNIT – II: (18 hours)

Basis and dimension – Homomorphism - Dual spaces.

(Text Book 1 - Chapter 6: Sections 6.5 - 6.7)

UNIT – III: (18 hours)

Inner product spaces - Eigen values and eigen vectors - Matrix algebra.

(Text Book 1 - Chapter 6: Section 6.8, Chapter 7: Sections 7.2 - 7.3)

UNIT – IV: (18 hours)

The rank of a matrix - Linear equation - Hermitian and UNITary transformations.

(Text Book 1 - Chapter 7: Sections 7.6, 7.7 and 7.9)

UNIT – V: (18 hours)

Partially ordered set – Lattices - Distributive lattices - Modular Lattices - Boolean algebra

(Text Book 2 - Chapter 9: Sections 9.1 - 9.5)

Activity:

Problems based on basis and dimensions

Text books:

1. M. L. Santiago, Modern Algebra, Tata McGraw Hill Publishing Company Ltd. New Delhi, 2001
2. Modern Algebra, Dr. S. Arumugam, A. Thangapandiassac, SCITECH publications (India) (P) limited, 2003

Reference books:

1. Seymour Lipschutz, 3000 solved problems in linear algebra, Schaum's solved problem series, 1988.
2. Stephen H. Friedberg, Arnold J. Insel and Lawrence E. Spence, Linear Algebra, Fourth Edition, PHI Learning Private Limited, New Delhi, 2014.

E-learning Sources:

1. https://onlinecourses.nptel.ac.in/noc26_ma21/preview
2. <https://nptel.ac.in/courses/111106051>

COMPLEX ANALYSIS

(Course Code: 26UMTC62)

Semester - VI

Core – T13

Hours - 6

Credits - 4

Course Outcomes: By the end of the course the student will be able to

- CO1** Apply limits, continuity, differentiability, and Cauchy–Riemann equations to complex functions (K4)
- CO2** Identify and analyze analytic and harmonic functions and their properties (K1)
- CO3** Use conformal mapping and bilinear transformations to map regions in the complex plane (K3)
- CO4** Evaluate complex integrals using Cauchy’s Theorem and Cauchy’s Integral Formula (K5)
- CO5** Expand complex functions using Taylor and Laurent series and classify singularities (K3)
- CO6** Apply residue theory to evaluate complex and real definite integrals (K4)

UNIT I

(18 hours)

Functions of a Complex Variable- Limits - Theorems on Limit - Continuous Functions - Differentiability - The Cauchy-Riemann Equations - Analytic Functions - Harmonic Functions

(Chapter: 2 Section 2.1 - 2.8)

UNIT II

(18 hours)

Conformal Mapping - Elementary Transformations - Bilinear Transformations - Cross Ratio - Fixed Points of Bilinear Transformations

(Chapter: 2 Section 2.9, Chapter: 3 Section 3.1 - 3.4)

UNIT III

(18 hours)

Definite integral - Cauchy's Theorem - Cauchy's Integral Formula - Higher Derivatives

(Chapter: 6 Section 6.1 - 6.4)

UNIT IV

(18 hours)

Sequences and series - Power series (theorems without proof) - Taylor's Series - Laurent's Series - Zeros of an Analytic Function - Singularities

(Chapter: 4 Section 4.1, 4.5, Chapter: 7 7.1 - 7.4)

UNIT V

(18 hours)

Residues - Cauchy's Residue Theorem - Evaluation of Definite Integrals

(Chapter: 8 Section 8.1 - 8.3)

Text book:

S. Arumugam, Thangapandi Issac and A. Somasundaram, Complex Analysis, Scitech publication, 2010.

Reference books:

1. S. Ponnusamy, Foundations of Complex Analysis, second edition, Alpha science publications, 2011.

2. James Ward Brown, Ruel V. Churchill, Complex Variables and Applications (Eighth Edition), McGraw Hill Publishers, 2003.

E-learning sources:

1. https://www.classcentral.com/course/youtube-complex-integration-cauchy-and-residue-theorems-essence-of-complex-analysis-6-114683?utm_source=chatgpt.com
2. https://www.classcentral.com/course/youtube-contour-integral-complex-variable-integration-complex-analysis-engineering-mathematics-jee-456378?utm_source=chatgpt.com
3. https://www.youtube.com/watch?v=NlxZp_UBQRU&utm_source=chatgpt.com

MECHANICS

(Course Code: 26UMTC63)

Semester - VI

Core – T14

Hours - 6

Credits - 4

Course Outcomes: By the end of the course the students will be able to

- CO1** Explain the laws of forces and Lami's theorem (K2)
- CO2** Describe the equilibrium of strings and its applications (K2)
- CO3** Solve simple problems related to projectiles (K3)
- CO4** Analyze Newton's laws in real life situations (K4)
- CO5** Evaluate the problems using simple pendulum and its applications (K5)
- CO6** Develop the knowledge about simple harmonic motion (K6)

UNIT-I (18 hours)

Forces acting at a point - resultant and components - parallelogram of forces - triangle law of forces - Lami's theorem - applications.

(Text book 1: Chapter 2)

UNIT – II (18 hours)

Equilibrium of Strings - the common catenary - approximations to the shape of the catenary - applications.

(Text book 1: Chapter 11)

UNIT – III (18 hours)

Laws of motion - Newton's laws of motion - motion of a particle on a rough horizontal plane - pressure of a body - atwood's Machine - tension in an elastic string - work done – energies.

(Text book 2: Chapter 4:4.1 to 4.36)

UNIT – IV: (18 hours)

Projectiles - the path of a projectile - characteristics of the motion of a Projectile - velocity of the projectile - range on an inclined plane - time of flight - motion on the surface of a smooth inclined plane.

(Text book 2: Chapter 6:6.1 to 6.16)

UNIT – V: (18 hours)

Simple harmonic motion - simple harmonic motion in a straight line - general solution of the S.H.M equation - geometrical representation of a S.H.M - composition of two simple harmonic motion of the same period and in the same straight line - composition of two simple harmonic motion of the same period and in perpendicular directions - forces necessary to produce simple harmonic motion - motion of a particle suspended by a spiral spring - horizontal oscillations of a particle tied to an elastic string - simple pendulum - period of a oscillation of a simple pendulum - equivalent simple pendulum - applications.

(Text book 2: Chapter 10)

Text books:

1. M. K. Venkataraman, Statics, Agasthiar Publications, Trichy, 2020.
2. M. K. Venkataraman, Dynamics, Agasthiar Publications, Trichy, 2020.

Reference books:

1. Rajeswari, Mechanics, Saras publication, Nagercoil, 2016.

2. S. L. Kakani, C. Hemrajani and S. Kakani, Mechanics (Second edition), Viva Student edition, 2012.

E-Learning Source:

1. <https://nptel.ac.in>
2. <https://www.google.com/url?sa=t&source=web&rct=j&opi=89978449&url=https://pressbooks.bccampus.ca/universityphysicssandbox/chapter/projectile-motion/&ved=2ahUKEwjf-JvXn7qSAxU5R2wGHeT0Jy8QFnoECEAAQ&usg=AOvVaw3WG1iahZQo5skvwjX9Iyhl>

NUMERICAL METHODS

(Course Code: 26 UMTE 61)

Semester - VI

EC – T6

Hours - 5

Credits - 3

Course Outcomes: By the end of course the student will be able to

- CO1** Recall the basics of numerical methods of differentiation and integration. (K1)
- CO2** Compute the roots of algebraic and transcendental equations using numerical methods.(K2)
- CO3** Solve the simultaneous equations using iterative methods.(K3)
- CO4** Calculate the derivatives and integration using numerical methods. (K3)
- CO5** Analyze the various interpolation of functions. (K4)
- CO6** Derive the solutions for differential equations. (K6)

UNIT - I: (15 hours)

Algebraic and transcendental equations - Introduction - errors in numerical computation - iteration method - bisection method - Regula-Falsi method - Newton-Raphson method.

(Chapter 3: Sections 3.0 - 3.5)

UNIT - II: (15 hours)

Introduction - simultaneous equations - back substitution - Gauss Elimination method -Gauss-Jordan elimination method - iterative methods – Gauss-Jacobi iteration method - Gauss-seidel iteration method

(Chapter 4: sections 4.0 - 4.4, 4.7 and 4.8)

UNIT - III: (15 hours)

Finite differences- introduction - difference operators - other difference operators – interpolation – introduction - Newton's interpolation formulae - Lagrange's interpolation formulae - divided differences - Newton's divided differences formula.

(Chapter 6: Sections 6.0 - 6.2, Chapter 7: sections 7.0, 7.1, 7.3 - 7.5)

UNIT - IV: (15 hours)

Numerical Differentiation and Integration - Introduction - derivatives using Newton's forward difference formula and Newton's backward difference formula - derivatives using central difference formulae - numerical integration.

(Chapter 8: Sections: 8.0 - 8.3, 8.5)

UNIT - V: (15 hours)

Numerical solutions of Ordinary Differential Equations - Introduction - Taylor's series method - Picard's method - Euler's method - Runge - Kutta methods – Predictor-corrector methods - Milne's method.

(Chapter 10: Sections 10.0 - 10.6)

Activity:

Use python program to solve an equation using the Newton-Raphson method

Text book:

S. Arumugam, A. Thangapandi Issac and A. Somasundaram, Numerical methods, Scitech Publications (India) Pvt Ltd, 2008.

Reference books:

1. Singaravelu. A, MA 1251 Numerical methods, Meenakshi academy, 2008.
2. Babu Ram, Numerical methods, Pearson, 2010.

PHP, DATABASE INTEGRATION AND WEB SECURITY

(Course Code: 26UMTE61)

Semester – VI

EC – T7

Hours – 5

Credits - 3

Course outcomes: By the end of the course the students will be able to

- CO1** Recall basic concepts of web architecture, PHP syntax and database terminology (K1)
- CO2** Explain control structures, arrays, functions and form handling mechanism in PHP (K2)
- CO3** Develop simple dynamic web applications using PHP and MySQL(K3)
- CO4** Implement database connectivity and perform CRUD operations securely (K3)
- CO5** Analyze common web vulnerabilities such as SQL injection and XSS. (K4)
- CO6** Design a basic secure login and session management system following secure coding principles(K5).

UNIT - I: (15 hours)

Introduction to Dynamic web content – Introduction to PHP – Expressions in PHP

(Text Book 1: Chapter 1, 3, 4(Expressions and Operators))

UNIT - II: (15 hours)

Control flow in PHP – PHP Functions and Objects – PHP Arrays

(Text Book 1: Chapter 4(Conditionals, Looping, Implicit and Explicit Casting), 5, 6)

UNIT - III: (15 hours)

Introduction to MySQL – Mastering MySQL.

(Text Book 1: Chapter 8, 9)

UNIT - IV: (15 hours)

Accessing MySQL using PHP – Form Handling – Cookies, Sessions and Authentications

(Text Book 1: Chapter 10, 11,12)

UNIT - V: (15 hours)

Security Fundamentals – Browser Security Principles- Database Security Principles

(Text Book 2: Chapters 2, 6, 7)

Text book:

1. Robin Nixon, Learning PHP, MySQL & JavaScript, O'Reilly Media, 5th Edition, 2018.
2. Bryan Sullivan and Vincent Liu, Web Application Security: A Beginner's Guide, Mc Graw Hill Publications, 2012

Reference books:

1. Larry Ullman, PHP and MySQL for Dynamic Web Sites, PechpitPresss, 4th edition, 2008

2. Lynn Beighley and Michael Morrison, Head First PHP & MySQL, O'Reilly Media, 5th Edition, 2018.
3. Dafydd Stuttard and Marcus Pinto, The Web Application Hacker's Handbook, Wiley Publishers, 2nd edition, 2011.

INTRODUCTION TO MACHINE LEARNING

(Course Code : 26UMTE61)

Semester – VI

EC-T7

Hours - 5

Credits – 3

Course Outcomes: By the end of the course the student will be able to

CO1 Recall the basics of R data structures. (K1)

CO2 Explain the different type of learning. (K2)

CO3 Apply notions to Machine Learning. (K3)

CO4 Analyze the dataset using cluster analysis. (K4)

CO5 Evaluate the concept of Tree and Probabilistic Model. (K5)

CO6 Compare Machine Learning in R with Spark - Machine Learning in R with H₂O (K5)

UNIT - I: (15 hours)

Introducing Machine Learning: The origins of machine learning - uses and abuses of machine learning - How machines learn - Machine learning in practice - Machine learning with R

(Text Book 1, Chapter – 1)

UNIT – II: (15 hours)

Managing and Understanding Data: R Data Structures - Managing data with R - Exploring and understanding data

(Text Book 1, Chapter - 2)

UNIT – III: (15 hours)

Machine Learning Theory and Practice: Machine Learning Types - Groups of Machine Learning Algorithms - Regression Analysis - Correlation Analysis

(Text Book 2, Chapter – 6 (6.1, 6.2, 6.4, 6.5))

UNIT – IV: (15 hours)

Support Vector Machine SVM - Decision Trees - The Naive Bayes Method - Cluster Analysis

(Text Book 2, Chapter – 6 (6.6-6.9))

UNIT – V: (15 hours)

Scalable Machine Learning and Related Technologies: Distributed Processing and Storage - The Hadoop Ecosystem - Machine Learning in R with Spark - Machine Learning in R with H₂O

(Text Book 2, Chapter – 10)

Text book:

1. Brett Lantz, Machine Learning with R - Second Edition, Packt Publisher, 2015.
2. Karthik Ramasubramanian and Abhishek Singh, Machine Learning Using R, Apress Berkeley, CA 2019

INTRODUCTION TO DATA SCIENCE

(Course Code : 26UMTE61)

Semester – VI

EC-T7

Hours - 5

Credits – 3

Course Outcomes: By the end of the course the student will be able to

CO1 Recall the basics of data operations. (K1)

CO2 Explain the exploratory data analysis. (K2)

CO3 Apply basic machine learning algorithms. (K3)

CO4 Analyze the dataset using linear regression. (K4)

CO5 Evaluate the network analysis. (K5)

CO6 Analyze regression (K4)

UNIT – I: (15 hours)

Introduction, Toolboxes: Python, fundamental libraries for data Scientists. Integrated development environment (IDE). Data operations: Reading, selecting, filtering, manipulating, sorting, grouping, rearranging, ranking, and plotting.

(Ch: 1,2)

UNIT – II: (15 hours)

Descriptive statistics, data preparation. Exploratory Data Analysis data summarization, data distribution, measuring asymmetry. Sample and estimated mean, variance and standard score. Statistical Inference frequency approach, hypothesis testing using confidence intervals, using p-values

(Ch: 3,4)

UNIT – III: (15 hours)

Supervised Learning: First step, learning curves, training-validation and test. Learning models generalities, support vector machines, random forest. Examples

(Ch: 5)

UNIT – IV: (15 hours)

Regression analysis: linear regression simple linear regression, multiple & Polynomial regression, Sparse model.

(Ch: 6)

UNIT – V: (15 hours)

Unsupervised learning: clustering, similarity and distances, quality measures of clustering, case study.

(Ch: 7)

Text book:

1. Laura Igual and SantiSeguí, Introduction to Data Science a Python approach to concepts, Techniques and Applications, Springer, 2017

Reference book:

1. Data Analysis with Python A Modern Approach, David Taieb, Packt Publishing, ISBN: 9781789950069
2. Python Data Analysis, Second Ed., Armando Fandango, Packt Publishing, ISBN: 9781787127487

TECHNIQUES IN REASONING

(Course Code: 26UMTS61)

Semester - VI

SEC - 6

Hours - 2

Credits -2

Course Outcomes: By the end of the course the student will be able to

- CO1** Recall the fundamental concepts of verbal reasoning and logical thinking. (K1)
- CO2** Explain reasoning techniques such as analogy, classification, series, and coding–decoding.(K2)
- CO3** Apply alphabet tests and coding–decoding methods to solve logical reasoning problems (K3)
- CO4** Apply logical reasoning to solve problems on blood relations and direction sense (K3)
- CO5** Analyze mathematical reasoning and non-verbal reasoning problems involving numbers, figures, mirror images, and patterns (K4)
- CO6** Develop logical, analytical, and problem-solving skills required for academic learning and competitive examinations(K6)

Eligibility: For Mathematics Major Students Only.

VERBAL REASONING

UNIT- I: (6 hours)

Series completion – analogy – coding -decoding.

(Part I: Section I: Chapters 1, 2 and 4)

UNIT- II: (6 hours)

Blood relations – puzzle test - alphabet test - inserting the missing character.

(Part I: Section I: Chapters 5, 6, 10 and 16)

UNIT- III: (6 hours)

Direction sense test – alpha numeric sequence - mathematical operations.

(Part I: Section I: Chapters 8,11 and 13)

NON-VERBAL REASONING

UNIT- IV: (6 hours)

Series completion - mirror images - water images - spotting out the embedded figures.

(Part II: Chapters 1, 5, 6 and 7)

UNIT- V: (6 hours)

Completion of incomplete pattern - figure matrix - cubes and dice - dot situation.

(Part II: Chapters 8, 9, 14 and 15)

Activity: Solve reasoning problems involving completion of patterns, figure matrices, cubes, dice and dot situations and justify the choice of the correct figure.

Text book:

R.S. Aggarwal, A modern approach to verbal and non-verbal reasoning, S. Chand and Company Ltd, Ram Nagar, New Delhi.

Reference book:

J. K Chopra, Reasoning and Aptitude test, Unique Publishers, 2012.

E-Learning Resources:

- <https://www.indiabix.com/logical-reasoning/questions-and-answers/>
- <https://www.careerride.com/Reasoning.aspx>
- <https://nptel.ac.in/>

QUESTION PATTERN**Internal Assessment (CIA)**

Part A	Answer All: 15 objective type Questions $\times$ 1 mark = 15 marks
Part B	Answer 10 Short Questions (out of 12) $\times$ 2 marks = 20 marks
Total Marks	35

Semester Examination

Total Number of Questions	60 (12 Objective-Type Questions for Each UNIT)
Answer	50 Questions $\times$ 2 marks = 100 marks
Total Marks	100

ADD ON Course
MATHEMATICAL QUOTIENT
(Course Code:26UMTAO1)

Credits - 2

Course Outcomes: By the end of the course the student will be able to:

- CO1** Describe the specific knowledge of profit and loss(K1)
- CO2** Explain the concepts of pipes and cisterns (K2)
- CO3** Solve problems related to time and distance. (K3)
- CO4** Analyze the concepts of Time and Work. (K4)
- CO5** Evaluate the data interpretation problems (K5)
- CO6** Build the mental ability to face the competitive examination. (K6)

Eligibility: For all I B.Sc. Mathematics students

UNIT- I:

Problems on Ages – Profit and Loss.

(Sec I: Chapter 8, 12)

UNIT- II:

Time and Work – Time and Distance.

(Sec I: Chapter 17, 18)

UNIT -III:

Ratio and Proportion – Partnership.

(Sec I: Chapter 13, 14)

UNIT- IV:

Pipes and Cisterns – Boats and Streams.

(Sec I: Chapter 16, 19)

UNIT -V:

Data Interpretation: Tabulation – Bar graphs.

(Sec II: Chapter 36, 37)

Skill based activity:

Collect the data related to the real life problems and interpret the results using the above concepts.

Text Book:

1. Dr. R. S. Aggarwal, Quantitative Aptitude, Revised Edition 2022.

Reference Book:

1. Manhattan PRE, Book of GRE Practice problems, 2nd Edition, World Class Instructors, Proven Results. (Online Resources)

VALUE ADDED COURSES
MATHEMATICAL APTITUDE
(Course Code:26UMTVA1)

Credits - 2

Course Outcomes: By the end of the course the student will be able to

- CO1** Describe the specific knowledge of square roots and cube roots (K1)
- CO2** Explain the concepts of surds and indices (K2)
- CO3** Evaluate the data interpretation problems. (K5)
- CO4** Analyze the concepts of banker's discount and true discount (K4)
- CO5** Compare between the simple interest and compound interest (K5)
- CO6** Build mental ability to approach the competitive examination (K6)

Eligibility :For all II B.Sc. Mathematics students

UNIT - I:

Square roots and Cube roots - Average

(Chapters 5 and 6)

UNIT- II:

Surds and Indices - Percentage.

(Chapters 9 and 11)

UNIT- III:

Simple Interest - Compound Interest

(Chapters 21 and 22)

UNIT- IV:

True Discount – Banker's Discount

(Chapters 32 and 33)

UNIT- V:

Data Interpretation: Pie Chart – Line Graphs

(Chapters 38 and 39)

Skill based activity:

Using digital tools to create and analyze pie charts & line graphs using real data.

Text Book:

R.S. Aggarwal, Quantitative Aptitude for competitive Examinations, S. Chand and company Ltd., 2017.

Reference Books:

1. Topic-wise solved papers for IBPS/SBI Bank PO/ Clerk prelims and Mains (Quantitative Aptitude – 2010-16), Disha publication.
2. P. Gupta, Quantitative Aptitude, Unique publishers.
3. Manhattan PRE, Book of GRE Practice problems, 2nd Edition, World Class Instructors, Proven Results. (Online Resources)

TRAINING FOR JAM EXAMINATION

(Course Code:26UMTVA2)

Credits-2

Course Outcomes: By the end of the course the student will be able to:

- CO1** Identify the problems in algebra and analysis (K1)
- CO2** Discuss the concepts in algebra and linear algebra (K2)
- CO3** Determine the techniques for solving problems (K3)
- CO4** Classify methods for solving problems (K4)
- CO5** Evaluate the integral equations (K5)
- CO6** Build the mental ability to face the competitive examination. (K6)

Eligibility : For all II B.Sc. Mathematics students

UNIT I:

Sequences and Series of Real numbers: Convergene of sequences, bounded and monotone sequences, Cauchy sequences, Bolzano-Weierstrass theorem, absolute convergence, tests of convergence for series- comparison test, root test, power series(of one real variable), radius and interval of convergence, term-wise differentiation and integration of power series.

UNIT II:

Functions of one real variable: limit, continuity, intermediate value property, differentiation, Rolle's theorem, mean value theorem, L Hospital's rule, Taylor's theorem, Taylor's series, maxima and minima, Riemann integration (definite integrals and their properties), fundamental theorem of calculus.

UNIT III:

Functions of two or three variables: limit, continuity, partial derivatives, total derivative, maxima and minima.

Integral Calculus: double and triple integrals, change of order of integration, calculating surface areas and volumes using double integrals, calculating volumes using triple integrals.

UNIT IV:

Differential Equations: Bernoulli's equation, exact differential equations, integrating factors, orthogonal trajectories, homogeneous differential equations, method of separation of variables, linear differential equations of second order with constant coefficients, method of variation of parameters, Cauchy-Euler equation.

Matrices: Systems of linear equations, rank, nullity, rank-nullity theorem, inverse, determinant, eigenvalues, eigenvectors.

UNIT V:

(6 hours)

Finite Dimensional Vector Spaces: Linear independence of vectors, basis, dimension, linear transformation, matrix representation, range space, null space.

Groups: Cyclic groups, abelian groups, non-abelian groups, permutation groups, normal subgroups, quotient groups, Lagrange's theorem for finite groups, group homomorphisms.

Text Book:

1. Previous year JAM Mathematics Question papers.

Ref: https://jam.iitm.ac.in/Test_Paper.php

EXTRA CREDIT COURSES

R PROGRAMMING

(Course Code: 26UMTEC1)

ECC (Self Study)

Credits – 2

Course Outcomes: By the end of the course the student will be able to

CO1 Recall the basics of R programming (K1)

CO2 Explain how to use R for statistical programming, computation, graphics, and modeling (K2)

CO3 Apply functions to Matrix Rows and Columns (K3)

CO4 Outline simulation programming in R (K4)

CO5 Create Data Frames (K6)

CO6 Develop R programs for the given task (K6)

UNIT - I:

Gaining started - Introduction to Functions - Important R Data Structures - Gaining Help - vectors - Declarations - Common Vector Operations - Using all() and any() - Vectorized Operations - NA and NULL Values

UNIT - II:

Filtering - The Selection Function which() - The ifelse() Function - Vector Element Names - Matrices and Arrays - General Matrix Operations - Filtering on Matrices - Applying Functions to Matrix Rows and Columns - Adding and Deleting Matrix Rows and Columns - More on the Vector/Matrix Distinction - Higher-Dimensional Arrays - Lists - Creating Lists - General List Operations - Accessing List Components and Values - Applying Functions to Lists - Recursive Lists.

UNIT - III

Data frames - Creating Data Frames - Other Matrix-Like Operations - Merging Data Frames - Applying Functions to Data Frames - Factors and Tables - Factors and Levels - Common Functions Used with Factors

UNIT - IV

Working with Tables - Other Factor- and Table-Related Functions - R Programming Structures - Control Statements - Arithmetic and Boolean Operators and Values - Default Values for Arguments - Return Values - Functions Are Objects - Environment and Scope Issues - No Pointers in R - Writing Upstairs - Recursion - Replacement Functions - Anonymous Functions

UNIT – V

Doing Math and Simulations in R - Math Functions - Functions for Statistical Distributions - Sorting - Linear Algebra Operations on Vectors and Matrices - Set Operations - Simulation Programming in R.

Text Book

1. Norman Matloff, "The Art of R Programming: A Tour of Statistical Software Design", No Starch Press, 2011.

Reference Books

1. Michael J. Crawley, "The R Book", John Wiley & Sons Ltd, 2007.
2. Jared P. Lander, "R for Everyone", Pearson Education, Inc., 2014.

DATA ANALYTICS

(Course Code: 26UMTEC2)

ECC (Self Study)

Credits - 2

Course Outcomes: By the end of the course the student will be able to

CO1 Recall the basics of Statistics and Data Analysis (K1)

CO2 Recall the fundamentals of Python (K1)

CO3 Describe the types of data visualization (K2)

CO4 Apply classification techniques in Data Analytics (K3)

CO5 Outline Challenges for Big Data Analytics (K4)

CO6 Summarize Data Analytics for Pharmaceutical Discoveries (K5)

UNIT-I:

Data collection and management: Introduction, Sources of data, Data collection and APIs, Exploring and fixing data, Data storage and management, using multiple data sources; **Data Analysis:** Introduction, Terminology and concepts, Introduction to statistics, Central tendencies and distributions, Variance, Distribution properties and arithmetic, Samples/CLT, Basic machine learning algorithms, Linear regression, SVM, Naive Bayes.

(Textbook – 1, Chapters: 1 - 3 & Textbook – 2, Chapters: 1 - 3)

UNIT- II:

Machine Learning: Introduction and Concepts, Differentiating algorithmic and model-based frameworks; Regression: Ordinary Least Squares, Ridge Regression, Lasso Regression, K Nearest Neighbour, Regression & Classification; **Data Visualization:** Introduction, Types of Data Visualization, Data types, Data encodings, Retinal variables, mapping variables to encodings, Visual encodings.

(Textbook – 2, Chapter: 4, Textbook – 3, Chapter: 3, 9)

UNIT - III

Supervised Learning with Regression and Classification Techniques -1: Bias-Variance, Dichotomy Model, Validation Approaches, Logistic Regression, Linear Discriminant Analysis, Quadratic Discriminant Analysis, Regression and Classification Trees, Support Vector Machines. **Supervised Learning with Regression and Classification techniques -2:** Ensemble Methods: Random Forest Neural Networks Deep learning.

(Textbook – 4, Chapters: 4 - 5)

UNIT - IV

Unsupervised Learning and Challenges for Big Data Analytics: Clustering, Associative Rule Mining, Challenges for big data analytics. **Prescriptive Analytics:** Creating data for analytics through designed experiments, Creating data for analytics through Active Learning, Creating data for analytics through Reinforcement learning. **Introduction to Python Packages:** Fundamentals of Python, Inserting and Exporting Data, Data Cleansing, Checking and Filling Missing Data, Merging Data, Operations, Joins.

(Textbook – 4, Chapters: 1 - 3)

UNIT - V

Applications of Data Analytics: Technologies for visualization, Bokeh (Python), recent trends in various data collection and analysis techniques, various visualization techniques, application development methods used in data analytics. **Applications and Practical Systems for Healthcare:** Data Analytics for Pervasive Health- Fraud Detection in Healthcare- Data Analytics for Pharmaceutical Discoveries- Clinical Decision Support

Text Books:

1. Roger Sapsford and Victor Jupp, “Data collection and analysis”, SAGA publisher, 2nd Edition, 2003.
2. Introduction to Data Science, Davy Cielen, Arno D B Meysman and Mohamed Ali, Manning, dreamtech press.
3. E. Alpaydin, “Introduction to Machine Learning”, 2nd Edition, MIT Press, 2010.
4. Hefin I. Rhys, “Machine learning with R, the tidyverse, and mlr, e-book, online, MANNING Publisher, 2020.
5. Hui Yang and Eva K. Lee, “Healthcare Analytics: From Data to Knowledge to Healthcare Improvement”, Wiley, 2016.

References:

1. Hastie, Trevor, et al., “The elements of statistical learning”, Vol. 2. No.1, New York: Springer, 2009.
2. Samir Madhavan., “Mastering Python for Data Science”, Packt, 2015.
3. Mark Lutz., “Learning Python” O’Reilly, 5th Edition, 2013.
4. Tiffany Bergin, “An Introduction to Data analysis – Quantitative, Qualitative and Mixed Models”, SAGA Publisher, 2018
5. Shai Shalev-Shwartz, Shai Ben-David, “Understanding Machine Learning: From Theory to Algorithms”, Cambridge University Press, 2014.

STATISTICAL METHODS
(Course Code: 26UMTEC3)

ECC (Self Study)

Credits - 2

Course Outcomes: By the end of the course the student will be able to

CO1 Explain the concept of sampling design and methods (K2)

CO2 Discuss the rules and types of classification (K2)

CO3 Apply various statistical tools for solving real life problems (K3)

CO4 Analyze the primary and secondary data (K4)

CO5 Classify diagrammatic representation and graphic presentation (K4)

CO6 Design questionnaire for collecting data (K6)

Eligibility: For all UG students

UNIT - I: Collection of Data

Primary and Secondary Data, Direct Personal Observation, Indirect Oral Interview, Information Through Agencies, Mailed Questionnaires, Schedules sent through Enumerators, Sources of Secondary Data, Precautions in the use of Secondary Data, Framing Questionnaires, Theoretical Questions.

(Chapter 4)

UNIT - II: Sampling Design

Finite and infinite population. Hypothetical and Existent Population, Census method, Sample Method, Essentials of Sampling. Methods of sampling, Random Sampling method, Non-Random Sampling, Simple Random Sampling, Restricted Random Sampling, Stratified Sampling, Systematic Sampling, Cluster Sampling, Judgement Sampling, Quota Sampling, Convenience or churk Sampling, Statistical laws, The Law of Statistical regularity, The Law Inertia of Large Numbers, Statistical Error, Measurement of Errors, Test of Reliability of Samples, Theoretical Questions.

(Chapter 5)

UNIT - III: Classification and Tabulation

Introduction, Meaning of Classification, Chief Characteristics of Classification, objects of Classification, Rules of Classification, Types of Classifications, Geographical Classification, Chronological Classification, Qualitative Classification, Quantitative Classification, Statistical Series, Types of Series, Frequency Distribution, Continuous Frequency Distribution, class frequency, Magnitude of class Intervals, Cumulative Frequency Distribution, Two-way Frequency Distribution, Tabulation of data, Meaning, objects, Difference between Classification and Tabulation, Parts of tabulation, Structure of Tabulation, Rules for Tabulation, Types of tables, On the basis of Originality, Illustration, Theoretical Questions, Practical Problems.

(Chapter 6)

UNIT - IV: Diagrammatic Representation

Limitations of a diagram, rules for making a diagram, types of diagram, one dimensional diagram, two dimensional diagram (Area of surface diagram), three dimensional diagram, Pictogram, cartogram, choice or selection of a diagram, Theoretical questions, practical problems.

(Chapter 7)

UNIT - V: Graphic Presentation

Advantages of Graphic Presentation, Construction of a graph, General Rules, Difference Between Diagram and graph, Graph of Frequency Distribution: Histogram, Frequency Polygon, Frequency Curve, Ogive or Cumulative Frequency Curves, more than Ogive, Graph of Time Series: Horizontal Line Graph of Histogram, False Base lines, Silhouette (Net Balance Graph) Range of Variation Graph, Component or Band Graph, Z Curve, Theoretical Questions.

(Chapter 8)

Text Book:

R. S. N, Pillai and Bagavathi, Statistics, Theory and Practice, S. Chand and Company Ltd, 2013.

Reference Book:

S. C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11th Edition, Sultan Chand and Sons, 1982.

QUANTITATIVE APTITUDE

(Course Code: 26UMTEC4)

ECC (Self Study)

Credits - 2

Course Outcomes: By the end of the course the students will be able to

- CO1** Understand and explain ranking tests, seating arrangements, calendar, clock, and input–output problems.(K2)
- CO2** Apply logical reasoning to solve problems on matrices, classification, cubes and cuboids, and Venn diagram(K3)
- CO3** Solve puzzle-based problems involving inequalities and digit aptitude using logical reasoning.(K3)
- CO4** Apply permutations, combinations, probability, and arithmetic reasoning to solve aptitude problems(K3)
- CO5** Analyze statements to draw valid conclusions using decision making and syllogism techniques.(K4)
- CO6** Develop analytical thinking and problem-solving skills required for competitive examinations and logical decision-making(K6)

Eligibility: Compulsory for III B.Sc. Mathematics students

UNIT - I:

Ranking Test - Seating Arrangement Test – Date, Calendar and Clock – Input and Password

(Text Book 1: Chapters 5, 6, 7, 11 and 13)

UNIT - II:

Matrix – Classification – Cube and Cuboid – Venn Diagram

(Text Book 1: Chapters 15, 16, 17 and 19)

UNIT - III:

Puzzle Test – Inequality – Digit Aptitude.

(Text Book 1: Chapters 22, 26 and 24)

UNIT - IV:

Statement and Conclusion – Decision Making - Syllogism

(Text Book 1: Chapters 26, 29 and 33)

UNIT – V

Permutations and Combinations – Probability – True Discount – Banker's Discount – Heights and Distances – Odd man out & Series.

Activity: Practicing of previous years' Government examination questions to improve analytical and quantitative problem solving

Text Book:

1. Dr. Lal, Mishra & Kumar, Multi-Dimensional Reasoning (Verbal and Non-Verbal), UpkarPrakashan, Agra,
2. Dr. R. S. Aggarwal, Quantitative Aptitude (for competitive examinations), S. Chand and company Limited, 2017

Reference Book:

U. Mohan Rao, Quantitative Aptitude (For Competitive Examinations), Scitech Publications (India) Pvt, Ltd, Chennai, 2012.

E-Learning Resources:

- <https://nptel.ac.in/>
- <https://www.geeksforgeeks.org/quantitative-aptitude/>
- <https://www.khanacademy.org/math>

QUESTION PATTERN

Semester Examination

Total Number of Questions	60 (12 Objective-Type Questions for Each UNIT)
Answer	50 Questions × 2 marks = 100 marks
Total Marks	100

HISTORY OF MATHEMATICS

(Course Code: 26UMTEC5)

ECC (Self Study)

Credits: 2

Course Outcomes: By the end of the course the student will be able to

- CO1** Acquire the knowledge in history of mathematics (K1)
- CO2** Understand how the ancient mathematicians worked together as a team to develop mathematical research (K2)
- CO3** Classify the history of mathematics through the time of its invention (K3)
- CO4** Identify significant role of mathematician in human development and promoting social harmony and analyze how the mathematical research was developed over the period of time (K4)
- CO5** Assess creative and flexible thinking by studying historical evidence that there are different ways to view a mathematical concept (K5)
- CO6** Evaluate the historical development of mathematical concepts and their influence on modern scientific and technological advancements (K6)

Eligibility: For all UG students

UNIT- I:Mathematics in Ancient India

Mathematics in Ancient India- Concept of Zero - Concept of Pi - Number System - Pythagoras Theorem- The Kerala School of Mathematics and Astronomy- History Of S.RAMANUJAN - GLORY AND TRAGEDY- Ramanujan's Magic Square- Ramanujan's works with Infinity

UNIT – II:

Pierre de Fermat (1601-1665) France- Évariste Galois (1811-1832) France-René Descartes (1596-1650) France- Johann Peter Gustav Lejeune Dirichlet (1805-1859) Germany- SrinivasaRamanujanIyengar (1887-1920) India- Carl G. J. Jacobi (1804-1851) Germany- Brahmagupta 'Bhillamalacarya' (589-668) Rajasthan (India).

UNIT – III:

Georg Cantor (1845-1918) Russia, Germany -Augustin-Louis Cauchy (1789-1857) France Arthur Cayley (1821-1895) England – Pythagoras of Samos (ca 578-505 BC) Greek domain - Aryabhata (476-550) Ashmaka&Kusumapura (India) - Leonardo 'Bigollo' Pisano (Fibonacci) (ca 1170-1245) Italy - William Rowan (Sir) Hamilton (1805-1865) Ireland - Diophantus of Alexandria (ca 250) Greece, Egypt.

UNIT – IV:

BhāscaraĀchārya (1114-1185) India - Jean-Baptiste le Rond d'Alembert (1717-1783) France - Joseph Liouville (1809-1882) France - Ferdinand Gotthold Max Eisenstein (1823-1852) Germany - Jacob Bernoulli (1654-1705) Switzerland - Johannes Kepler (1571-1630) Germany - Jacques Salomon Hadamard (1865-1963) France - Jean Baptiste Joseph Fourier (1768-1830) France.

UNIT – V:

Albert Einstein (1879-1955) Germany, Switzerland, U.S.A. - Galileo Galilei (1564-1642) Italy - Henri Léon Lebesgue (1875-1941) France - Johann Bernoulli (1667-1748) Switzerland – Felix Hausdorff (1868-1942) Germany - George Pólya (1887-1985) Hungary - Siméon Denis Poisson (1781-1840) France -Adrien Marie Legendre (1752-1833) France.

Text Book:

<http://fabpedigree.com/james/mathmen.htm#>

Website and e-Learning Source:

1.https://mjcollege.kces.in/pdf/download_documents/study_material_iks_sem_2/UNIT_1_b_maths_in_ancient_india_1.pdf

Reference Books

1. C.B. Boyer and U. Merzbach, History of Mathematics, John Wiley & Sons, 3rd edition, 2011.
2. E.T. Bell, Men of Mathematics, Published by Simon & Schuster, 1986.

FUNDAMENTALS OF WEB DEVELOPMENT

(Course Code: 26UMTEC5)

ECC (Self Study)

Credits: 2

Course Objectives: By the end of the course the student will be able to

- CO1** Explain basic HTML structure and elements (K2)
- CO2** Apply hyperlinks, images, and tables in HTML pages. (K3)
- CO3** Apply CSS rules to style HTML elements. (K3)
- CO4** Analyze CSS layout techniques and the box model. (K4)
- CO5** Design responsive web pages using HTML and CSS.(K6)
- CO6** Evaluate and construct web pages integrating HTML and CSS for effective design.(K5)

UNIT 1 Introduction to HTML

HTML: A Structure language, Document types, elements and characters, the rules of HTML, Major Themes, Logical and Physical HTML, Standards vs Practice, Myths about HTML and XHTML, Core HTML Attributes, Headings, paragraph and Breaks, Division and Centering, Quotations, text level elements.

UNIT 2 Link and Presentation Layout

Linking basics, URLs- concept, special features, formula, relative URLs, Linking in HTML, Anchor Attributes, Images and Anchors, Image Maps, - Image preliminaries, HTML Image Basics, Images as buttons, Image maps, HTML approach to Visual Design- fonts, colours in HTML, Colour attributes for Body, Tables and Layouts.

UNIT 3 Exploring CSS Fundamentals:

Introduction to Cascading Style Sheets (CSS), Applying CSS rules for styling HTML elements, Understanding typography and text formatting, Working with colours, backgrounds, margins, and padding, Introduction to CSS selectors.

UNIT 4 Styling with CSS Layouts

Understanding CSS layout techniques, Working with CSS box model, Creating responsive layouts using CSS media queries, Exploring CSS frameworks for layout and design, Applying advanced CSS techniques for layout customization.

UNIT 5 Building Responsive Web Pages:

Understanding the principles of responsive web design, creating responsive web pages using HTML and CSS, Testing and optimizing web pages for different devices and screen sizes, Introduction to CSS preprocessors for enhanced styling capabilities.

Text Books:

1. Powell, Thomas. HTML & XHTML: the complete reference. McGraw-Hill, Inc., 2003.

2. Godbole, Achyut, and Atul Kahate. "Web Technologies." McGraw Hill Education (India) Private Limited, 2013.
3. Jon Duckett, "HTML and CSS: Design and Build Websites" 2020

Reference Books:

1. McGrath, Mike. HTML, CSS & JavaScript in easy steps. In Easy Steps Limited, 2020.
2. Casabona, Joe. HTML and CSS: Visual QuickStart Guide. Peachpit Press, 2020.
3. Beaird, Jason, Alex Walker, and James George. The principles of beautiful web design. SitePoint Pty Ltd, 2020.

e-sources:

1. W3Schools HTML Tutorial: <https://www.w3schools.com/html/>
2. MDN Web Docs: <https://developer.mozilla.org/en-US/docs/Web/HTML>
3. CSS-Tricks: <https://css-tricks.com/>
4. MDN Web Docs: <https://developer.mozilla.org/en-US/docs/Web/CSS>

EXTRA CREDIT COURSES FOR OTHER MAJOR STUDENTS

SET THEORY

(Course Code: 26UMTEC7)

Semester – I

ECC (Self Study)

Credits - 2

Course Outcomes: By the end of the course the student will be able to

- CO1** List out the sets and the operations on sets (K1)
- CO2** Discuss the equivalence relations (K2)
- CO3** Examine the knowledge of functions and binary operations (K3)
- CO4** Apply the law of trichotomy and the properties of numbers to solve problems (K3)
- CO5** Analyze the number system and well ordering principle (K4)
- CO6** Create confidence to face the competitive examination (K6)

Eligibility: All UG students except those from the Department of Mathematics

UNIT - I:

Sets - operation on sets – union – intersection – difference - complement of a set - symmetric difference.

(Chapter 1: Sections 1.1 - 1.7)

UNIT - II:

Cartesian product - relations - equivalence relations - partial order.

(Chapter 1: Section 1.8, Chapter 2:
Sections 2.1 - 2.3)

UNIT - III:

Functions - Binary operations

(Chapter 2: Sections 2.4 - 2.5)

UNIT - IV:

Number systems - Peano's postulates - addition and multiplication in $\mathbb{N}$ - Properties- order in $\mathbb{N}$ - law of trichotomy - well ordering principle.

(Chapter 3: Sections 3.0-3.1)

UNIT - V:

The integers - addition and multiplication properties - order relation in $\mathbb{Z}$ - Identification of positive integers with natural numbers - Divisibility in $\mathbb{Z}$.

(Chapter 3: Sections 3.2 - 3.3)

Text Book:

Dr. S. Arumugam and A. Thangapandi Issac, Set theory, Number system and Theory of Equations, New gamma Publishing house.

Reference Books:

1. S. B. Malik, Basic Number Theory, Vikas Publishing House Private Limited, Reprint 2006.
2. Daniel W. Cunningham, Set Theory, A first course.

ANALYTICAL GEOMETRY OF TWO DIMENSION

(Course Code: 26UMTEC8)

Semester - II

ECC (Self Study)

Credits - 2

Course Outcomes: By the end of the course the student will be able to

CO1 Recollect the properties of straight lines and circles (K1)

CO2 Discuss the role of transformations and invariants (K2)

CO3 Discuss the concepts of polar system and conic sections (K2)

CO4 Solve problems using tangents and normals (K3)

CO5 Categorize the conics (K4)

CO6 Develop the skill to face competitive examination (K6)

Eligibility: All UG students except those from the Department of Mathematics

UNIT - I: METRIC PROPERTIES IN PLANE

Fundamental notions - transformations and invariants - Examples

(Chapter 1: Sections 1.1 - 1.2)

UNIT - II: STRAIGHT LINES IN PLANE

Different forms - A point in relation to a straight line - Pair of Straight lines

(Chapter 2: Sections 2.1 - 2.3)

UNIT - III: CIRCLES IN PLANE

Different forms - A point in Relation to a Circle - A line in Relation to a circle.

(Chapter 3: Sections 3.1- 3.3)

UNIT - IV:

Tangents and normals - Pole and Polar - System of Circles.

(Chapter 3: Sections 3.4 - 3.6)

UNIT - V:

Some Fundamental Notions – Parabola – Ellipse – Hyperbola.

(Chapter 4: Section 4.1- 4.4)

Text Book:

D. Chatterjee, Analytical geometry of Two Dimension, Narosa publishing House, 1999.

Reference Book:

K.C.Mathew, S.Veeraraghavan and T.Raghavan, A Text Book of Co-ordinate Geometry of two and three dimensions, S.Chand and Company (Pvt), LTD, 1988.

PYTHON

(Course Code: 26UMTEC9)

Semester - III

ECC (Self Study)

Credits - 2

Course Outcomes: By the end of the course the student will be able to

- CO1** Identify the errors in the given program (K1)
- CO2** Describe the basic operations in python programming (K2)
- CO3** Apply the decision making and looping statements (K3)
- CO4** Break down a program in to smaller functions (K4)
- CO5** Select the tools to write the given program (K4)
- CO6** Develop a python program for the given real time problem (K6)

Eligibility: All UG students except those from the Department of Mathematics

UNIT - I:

Data types in python: Comments in python-Docstrings-How python sees variables – Data types in Python – Built-in data types-Bool Data type – Sequences in python-Sets – Literals in python – Determining the data type of a variable – What about characters – User-defined data types – Constants in python – Identifiers and Reserved words – Naming conventions in python.

(Chapter 3)

UNIT - II:

Operators in Python: Operator - Arithmetic operators – Assignment operators – Unary minus operator – Relational operators – Logical operators – Boolean operators – Bitwise operators – Membership operators – Identity operators – Operator precedence and Associativity – mathematical Functions.

(Chapter 4)

Input and Output: Output statements – Input statements.

(Chapter 5)

UNIT - III:

Control statements: Control statements – The if statement – A word on indentation – The if...else statement – The if...elif...else statement- The while loop – The for loop – Infinite loops – Nested loops – The else suite – The break statement – The continue statement – The pass statement – The assert statement – The return statement

(Chapter 6)

UNIT - IV:

Strings and Characters: Creating strings – Length of a string – Indexing in strings – Slicing the strings – Repeating the strings – Concatenations of strings – Checking membership – Comparing strings.

Functions: Difference between a function and a method – Defining a function – Calling a function – Returning results from a function – Returning multiple values from a function – Functions are first class objects – Pass by object reference – Formal and actual arguments – Positional arguments – Keyword arguments – Default arguments – Variable

length arguments – Local and global variables – The global keyword – Passing a group of elements to a function – Recursive functions .

(Chapter: 8, 9)

UNIT - V:

Lists and Tuples: List – Creating lists using range() function – Updating the elements of a list – Concatenation of two lists – Repetition of lists – Membership in lists – Aliasing and cloning lists – Methods to process lists – Finding biggest and smallest elements in the list – Sorting the list elements – Number of occurrences of an element in the list – Finding common elements in two lists – Storing different types of data in a list – Tuples – Creating tuples – accessing the tuple elements – Basic operations on tuples – Functions to process tuples.

(Chapter 10)

Dictionary: Operations on dictionaries – Dictionary methods – Using for loop with dictionaries.

(Chapter 11)

Text book:

Dr. R. Nageswara Rao, Core python programming, Second edition, Dreamtech press, 2018.

Reference books:

1. Joseph Joyner, Python programming for beginners (Python programming language tutorial), Kindle edition.
2. Allen Downey, Jeffrey Elkner, Chris Meyers, Learning with Python, dream tech press, 2015.

CLASSICAL ALGEBRA

(Course Code: 26UMTEC10)

Semester - IV

ECC (Self Study)

Credits - 2

Course Outcomes: By the end of the course the student will be able to

- CO1** Describe exponential theorem and its applications (K1)
- CO2** Discuss the binomial and the logarithmic series and their applications (K2)
- CO3** Discuss the increase or decrease of the root by a given number (K2)
- CO4** Demonstrate Descartes's rule of signs (K3)
- CO5** Analyze the relation between roots and coefficients (K4)
- CO6** Create efficiency to face competitive examinations (K6)

Eligibility: All UG students except those from the Department of Mathematics

UNIT - I:

Binomial series: Binomial Theorem – Statement and Proof – Application to summation.

(Chapter 3: Sections 1,2 & 10, 11)

UNIT - II:

Exponential Theorem – Statement and Proof – Application to summation.

(Chapter 4: Sections 1 to 4)

UNIT - III:

Logarithmic series: Logarithmic series theorem – Statement and Proof – application to summation.

(Chapter 4: Sections 5 to 10)

UNIT - IV:

Theory of equations: Relation between the roots and coefficients – reciprocal equation.

(Chapter 6: Sections 1 to 11 & 16)

UNIT - V:

Theory of equations: To increase or decrease the root by a given numbers – Descartes's rule of sign.

Text Book:

T.K. Manicavachagom Pillay, T. Natarajan and K.S. Ganapathy, Algebra Volume I, S. Viswanatham (printers and publishers) Pvt. Ltd., 1999.

Reference Books:

1. S. Arumugam and Isaac, Allied Mathematics paper I, New Gamma Publishing House, 1996.
2. S. Arumugam and Isaac, Allied Mathematics paper IV, New Gamma Publishing House, 1996.

DIFFERENTIATION AND INTEGRATION

(Course Code: 26UMTEC11)

Semester – V

ECC (Self Study)

Credits -4

Course Outcomes: By the end of the course the student will be able to

- CO1** Recall differentiation of various forms of functions (K1)
- CO2** Discuss problems using Leibnitz theorem (K2)
- CO3** Explain the concepts of curvature, evolutes and envelopes (K2)
- CO4** Apply the method of substitution to evaluate integrals (K3)
- CO5** Apply the methods to integrate rational and irrational functions (K3)
- CO6** Compute integrals using integration by parts (K3)

Eligibility: All UG students except those from the Department of Mathematics

UNIT - I:

Derivatives of some standard functions -The chain rule - Differentiation of inverse functions - Differentiation by transformation - Logarithmic differentiation – Parametric differentiation - Differentiation of function with respect to functions - Differentiation of implicit function.

(Part I: Chapter 2: Sections 2.3 - 2.10)

UNIT - II:

Higher Derivatives - n^{th} derivatives and Leibnitz theorem.

(Part I: Chapter 2: Sections 2.11 and 2.12)

UNIT - III:

Curvature-Evolute- Envelope.

(Part I: Chapter 3: Sections 3.4 -

3.6)

UNIT - IV:

Some simple integrals- method of substitution - integration of rational functions - Integration of irrational functions - Integration of trigonometric functions

(Part II: Chapter 2: Sections 2.1 - 2.5)

UNIT - V:

Evaluation of definite integrals –Integration by parts - reduction formulae

(Part II: Chapter 2: Sections 2.6 - 2.8)

Text Book:

Dr. S. Arumugam and Mr. A. Thangapandi Issac, Calculus, New Gamma Publishing House, 2014.

Reference Books:

Tom M. Apostol, Calculus, Wiley Student Edition, 2011.

INTRODUCTION TO ASTRONOMY

(Course Code: 26UMTEC12)

Semester – VI

ECC (Self Study)

Credits -4

Course outcomes: By the end of the course the students will be able to

CO1 Recall the celestial bodies and celestial coordinates (K1)

CO2 Describe sidereal time and latitude of a place (K2)

CO3 Describe diurnal motion (K2)

CO4 Apply the Kepler's laws in Newton deductions (K3)

CO5 Analyze the seasons and calendar (K4)

CO6 Build the knowledge of astro-physics (K6).

UNIT - I:

Celestial sphere - celestial co-ordinates- sidereal times.

(Art: 39 – 64, 66-71)

UNIT - II:

Latitude of place - Hour angle and azimuth at rising - diurnal motion – duration of day time,

(Art: 72 – 78)

UNIT - III:

Morning and evening stars, circumpolar stars. Time taken by a star to rise - Diagram of the celestial sphere.

(Art: 80 - 83, 86)

UNIT - IV:

The Earth - zones of the earth - perpetual day. Twilight (Art:,87 – 90, 111 – 114, 116)

UNIT - V:

Seasons – calendar. The moon - phases of moon, eclipses

(Art: 173 – 179, 229 - 241, 256 – 259)

Text book:

S. Kumaravelu and Susheela Kumaravelu, Astronomy, Janki Calendar Corporation, Sivakasi, 2012.

Reference books:

1. S.K.Sharma, R.K. Gupta and Dharendra Kumar, Spherical Astronomy, KrishnaPrakashan Media (P) Ltd, Meerut, 2014.

2. W M Smart, A Text Book on Spherical Astronomy, 6th edition, revised by R.M. Green, Cambridge University Press, 1977.

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:

1. S. Arumugam and A. Thangapandi Issac, Summation of series and Trigonometry, New Gamma Publishing House, 2003.

2. S. Arumugam and A. Thangapandi Issac, Allied Mathematics paper I, New Gamma Publishing House, 2016.
3. 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: By 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 II: MATHEMATICS – II
(FOR CHEMISTRY)

(Course Code: 26UMAE21)

Semester - II	EC- T2	Hours - 6	Credits – 5
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Course Outcomes: By the end of the course the students will be able to

- CO1** Define group structures and recall ODEs and PDEs and integrals (K1)
- CO2** Explain Solutions for ODEs and PDE formation method, reduction formula derivations, integrals and Lagrange's theorem (K2)
- CO3** Apply coset computations, solve linear ODEs, first-order PDEs, evaluate definite integrals by parts and compute double/triple integrals (K3)
- CO4** Analyze ODE characteristic roots, PDE standard solutions, integral reduction formula and multivariable transformations order of an element (K4)
- CO5** Evaluate problems combining group orders, ODE systems, PDE solutions, definite integral evaluations, and multiple integral setups (K5)
- CO6** Evaluate ODE methods, PDE and volume/area calculations via integrals (K5)

UNIT I: **(15 hours)**

Linear equations with constant coefficients - Methods of finding complementary functions - Methods of finding particular integrals - Homogeneous linear equations.

(Text book 1: Chapter 6 (Sections 1- 4))

UNIT II: **(15 hours)**

Formation of partial differential equations - First order partial differential equations - Some standard forms.

(Text book 1: Chapter 7)

UNIT III: **(15 hours)**

Definite integrals - Integration by parts - Reduction formulae for $\sin^n x$, $\cos^n x$, and $\tan^n x$ only.

(Text book 2: Part II: Chapter 2(Sections 2.6 - 2.8))

UNIT IV: **(15 hours)**

Evaluation of Double integrals - Triple integrals - Jacobians - Change of variables in double and triple integrals.

(Text book 2: Part I: Chapter 3(Section 3.9), Part II: Chapter 3(Section 3.2 - 3.4))

UNIT V: **(15 hours)**

Groups - Subgroups - Cyclic groups - Order of an element - Cosets and Lagrange's theorem.

(Text book 3: Chapter 3(Sections 3.1, 3.5 - 3.8) Statements Only(No Proof))

Text books:

1. S. Arumugam and Issac, Allied Mathematics paper II, New Gamma Publishing House, 2007 (For **UNIT I** and II).
2. S. Arumugam and Issac, Calculus, New Gamma Publishing House, 2011 (For **UNIT III** and IV).
3. S. Arumugam and Issac, Allied Mathematics paper I, New Gamma Publishing House, 2004 (For **UNIT V**).

E- Resources:

1. **NPTEL (IITs)** – Video lectures and problem-solving sessions in Mathematics
<https://nptel.ac.in>

2. **Khan Academy** – Conceptual clarity with worked examples
<https://www.khanacademy.org>

3. **MIT Open Course Ware (OCW)** – Advanced explanations and lecture notes
<https://ocw.mit.edu>

4. **Paul's Online Math Notes** – Step-by-step solved examples
<https://tutorial.math.lamar.edu>