

**SRI SANKARA ARTS AND SCIENCE COLLEGE
(AUTONOMOUS)
ENATHUR, KANCHIPURAM - 631561**

B.Sc., MATHEMATICS

REGULATION & SYLLABUS

(Effective from the academic year 2023 – 2024)

Choice Based Credit System

**Learning Outcomes based Curriculum Framework
(LOCF)
Sri Sankara Arts and Science College
(Autonomous)
Department of Mathematics**

Contents

1. Preamble-----	02
2. Introduction-----	03
3. LOCF-----	04
4. Graduate Attributes for B. Sc Mathematics-----	05
5. Qualification descriptors for B. Sc Mathematics -----	06
6. Programme Specific Outcomes (PSO) of B. Sc Mathematics-----	07
7. Syllabus for B. Sc Mathematics-----	08
8. Course Outcomes (Cos)-----	107
9. PSO-CO Mapping-----	107
10. Teaching-Learning Process-----	118
11. Assessment Methods-----	119
12. Keywords-----	119

Preamble

We are happy to submit the report concerning the syllabi for B. Sc Mathematics. The committee discussed the framework of syllabi in its meetings and suggests the implementation of these syllabi in the Department of Mathematics in Sri Sankara Arts and Science College (Autonomous), Enathur, Kanchipuram based on following facts:

1. The learning outcomes of each paper are framed so that these may help learners to understand the main objectives of studying the course.
2. The objectives of LOCF are to mentally prepare the students to learn Mathematics leading to B. Sc Mathematics as a subject.
3. These syllabi in B. Sc Mathematics under CBCS are recommended keeping in view of the wide applications of Mathematics in science, engineering, social science, business and a tool of other areas.
4. The study of the syllabi will enable the students to be equipped with the state of the art of the subject and will empower them to get jobs in technological and engineering fields as well as in business, education and healthcare sectors.
5. The LOCF committee in Mathematics has prepared this draft paying suitable attention to objectives and learning outcomes of the papers. These syllabi may be implemented with minor modifications with appropriate justifications keeping in view regional, national and international context and needs. The outcomes of each paper may be modified as per the local requirements.
6. The papers are organized considering the credit load in a particular semester. The core papers of general interest are suggested for semesters I to IV. The elective courses proposed for the B. Sc Mathematics students of semesters V & VI.
7. The mathematics is a vast subject with immense diversity. Hence it is very difficult for every student to learn each area of mathematics, even though each paper has its unique importance.

Introduction

The important reforms in the B. Sc Mathematics level is to introduce the Learning Outcomes-based Curriculum Framework (LOCF) which makes it student-centric, interactive with well-defined aims goals to achieve. Outcome based learning is the major termination of pedagogical communications in higher education in today's world especially in mathematics, and the prevalent utilitarian world view of the society. The learning in outcomes is attained by students through skills acquired during a programme of study. Programme learning outcomes will include subject-specific skills and basic skills. It would also focus on knowledge and skills that prepare students for further study, employment, and citizenship. The quality of higher education in mathematics should be improved in such a manner that young minds are able to compete in this field altogether in terms of their knowledge and skills.

The goal of higher education in mathematics may be achieved using the following measures:

- i. Curriculum reform based on a learning outcomes-based curriculum framework (LOCF).
- ii. Improving learning environment and academic resources.
- iii. Elevating the quality of teaching and research.
- iv. Involving students in discussions, problem-solving and out of box thinking about various ideas of mathematics and their applicability, which may lead to empowerment and enhancement of the social welfare at large.
- v. Motivating the learners to understand various concepts of mathematics keeping in view the regional context.
- vi. Enabling learners to create research atmosphere in mathematical sciences in their colleges/institutes/universities.
- vii. Teach courses of mathematics based on Choice Based Credit System (CBCS).

One of the benchmarks to measure the progress of a country is the advancement of the knowledge of mathematics. Hence, innovative measures should be taken to improve the quality of mathematical knowledge in our society. This is also because mathematics has wide ranging applications in engineering, technology and a host of other areas.

LOCF

Learning Outcomes-based approach to Curriculum Planning

In the end of B.Sc Mathematics, students will be awarded on the basis of learners acquired knowledge, understanding, skills, attitudes, values and academic achievement. Hence, the learning outcomes of mathematics for these courses are aimed at facilitating the learners to acquire these attributes, keeping in view of their preferences and aspirations for framed knowledge of mathematics. The LOCF in mathematics has designed courses in the light of graduate attributes, description of qualifications, courses and programme learning outcomes. The syllabi of mathematics was framed by the committee in such a way that it may lead to all round development and delivery fulfilled curriculum. Guidelines provided in the aspects of, acquiring sufficient knowledge during this programme by the learner. The aims of Learning Outcomes-based approach to Curriculum (Mathematics) is to prepare the syllabi having standard level of study. The main objectives of the LOCF is to follow the norms for teaching-learning process and examination pattern. Therefore, the programme has been written out in such manner that there is scope of flexibility and innovation in

- I. Changes of recommended syllabi.
- II. Methodology of Teaching.
- III. Knowledge levels and Assessment Process of students.
- IV. LO (Learning outcomes) of courses.
- V. Elective courses introduced by availability of experts in colleges/institutes/universities across the country.

Graduate Attributes in Mathematics

The sum of the expected course learning outcomes mentioned in the beginning of each course are called the graduate attributes in mathematics. Some of are,

Disciplinary knowledge:

Learning one or more disciplines which form a part of an undergraduate programme of study.

Communications skills:

Ability to communicating various concepts of mathematics.

Critical thinking and analytical reasoning:

Ability to employ critical thinking in understanding the concepts in every area of mathematics. Ability to analyze the results and apply them in various problems appearing in different branches of mathematics

Problem solving:

Solving problems using computer graphics in various models such as growth and decay models, radioactive decay model, drug assimilation, LCR circuits and population models using techniques of differential equations.

Research-related skills:

To analyze the problem with its related concepts in various areas of mathematics.

Information/digital literacy:

To solve differential equations and system of equations using appropriate software and applying maths concepts in MatLab and other advanced software.

Self-directed learning:

Capability to work independently and do in-depth study of various areas of mathematics.

Qualification-descriptors

The qualification descriptors with the specifications of academic standards providing the racial outcomes and characteristics includes the following factors

- Level of knowledge
- Understanding
- Skills
- Competencies and attitudes
- Values
- The above parameters are experienced by the learners after graduation and are considered at the time of designing, approving, assessing and reviewing academic programme by all the institutions/Colleges. All the graduates will be benefitted with equal opportunity irrespective of class, gender, community and religion by learning experiences and assessment procedures.
- Each learner in the B.Sc Mathematics should be able to Knowledge in the subject enhance in specific manner to explore and getting jobs in engineering, science, technology and mathematical sciences with demonstration.
- Exploring the skills in the areas of analysis, geometry, algebra, mechanics, differential equations etc.
- Able to evaluate the problems with identifications, collections and analysis of problems with appropriate methodologies.
- To extend the subject knowledge in research works in diverse areas of mathematical sciences by fulfilling learning requirements.
- To explore subject skills newer domain and uncharted areas with its applications

Programme Outcomes:

- PO1:** Demonstrate basic manipulative skills in algebra, geometry, trigonometry, and beginning calculus
- PO2:** Apply the underlying unifying structures of mathematics (i.e. sets, relations and functions, logical structure) and the relationships among them
- PO3:** Demonstrate proficiency in writing proofs
- PO4:** Communicate mathematical ideas both orally and in writing
- PO5:** Investigate and apply mathematical problems and solutions in a variety of contexts related to science, technology, business and industry, and illustrate these solutions using symbolic, numeric, or graphical methods

PROGRAMME SPECIFIC OUTCOME

- PSO1:** To get critical and analytic thinking in theoretical aspect
- PSO2:** To solve the problem skills in practical aspect
- PSO3:** To understand the concept of Mathematics and it help to clear the NET/SET/GATE Exams
- PSO4:** To get new ideas basic learning and applying in order to employability

SRI SANKARA ARTS AND SCIENCE COLLEGE
(AUTONOMOUS)
CHOICE BASED CREDIT SYSTEM (CBCS)
B.Sc. Mathematics
(Effective from the academic year 2023 – 2024)

REGULATIONS

1. THE CBCS SYSTEM

All programmes (named after the core subject) mentioned earlier shall be run on Choice Based Credit System (CBCS). It is an instructional package developed to suit the needs of students to keep pace with the developments in higher education and the quality assurance expected of it in the light of liberalization and globalization in higher education.

2. ELIGIBILITY FOR ADMISSION

Candidates for admission to the first year of the Bachelor Degree shall be required to have passed the Higher Secondary Examinations (Academic or Vocational Stream) conducted by the Government of Tamil Nadu or an Examination accepted as equivalent thereof by the Academic Council of the Autonomous College.

3. ELIGIBILITY FOR THE AWARD OF DEGREE

A Candidate shall be eligible for the award of the Degree only if he/she has undergone the prescribed course of study in a Autonomous College for a period of not less than three academic years, passed the examinations of all the Six Semesters prescribed earning 140 credits in Parts-I, II, III, IV, V & VI and fulfilled such conditions as have been prescribed therefore.

The parent university will award degrees to the students evaluated and recommended by autonomous colleges. The degree certificates will be in a common format devised by the university. The name of the college will be mentioned in the degree certificate, if so desired. The declaration of results was decided by the examination committee.

4. DURATION

Each academic year shall be divided into two semesters. The first academic year shall comprise the first and second semesters, the second academic year the third and fourth semesters and the third academic year the fifth and sixth semesters respectively.

The odd semesters shall consist of the period from June to November of each year and the even semesters from December to April of each year. There shall be not less than 90 working days for each semester exclusive of the days for the conduct of semester examinations.

In each semester, Papers are administered in 15 teaching weeks and another 5 weeks are utilized for evaluation and grading purposes. Each week has 30 working hours spread over in a 5 day week. Depending upon the content and specialization, a paper may have 1 to 6 credits. Total number of teaching hours in a semester will be 450 hrs. One credit of each theory paper is equal to 15 hrs of lectures or 30 hrs of practical works.

5. COURSE OF STUDY

A Bachelor's programme consists of a number of papers. The term Course is used to indicate logical part of a subject matter of the programme. In each of Bachelor's programmes, there will be a prescription of (i) language – I (Tamil, Sanskrit or other languages), (ii) language – II (English), (iii) a set of compulsory courses (called core subjects), some optional courses (called elective / allied subjects) and projects, (iv) a set of papers recommended by UGC and TANSICHE (Advanced Tamil / Soft skill / Environmental Studies / Value education), (v) Extension activities and (vi) Certificate courses.

The detail of the Study for Bachelor Degree Courses shall consist of the following:

PART – I Language Courses (LC) [Tamil / Other Languages]

PART – II English Language Courses (ELC)

PART – III Core Subjects

Allied/Elective Subjects

Projects / Field work

PART – IV

1. (a) Those who have not studied Tamil up to XII Std. and taken a Non-Tamil Language under Part-I shall take Tamil comprising of two papers (level will be at 6th Standard).

Those who have studied Tamil up to XII Std. and taken a Non-Tamil Language under Part-I shall take Advanced Tamil comprising of two papers.

Others who do not come under a + b can choose non-major elective comprising of two papers.

2. Skill Based Subjects - Soft Skills

A candidate shall be eligible for the award of the degree only if he/she has undergone the prescribed papers on Soft Skills. For three years UG degree Programme, a candidate must undergo a minimum of 4 papers (4 x 3 = 12 credits). Papers will be finalized in due course.

3. Environmental Studies

A candidate shall be eligible for the award of the degree only if he/she has undergone the prescribed paper on Environmental studies. For three years UG degree Programme, a candidate must undergo environmental studies during third semester of second year (2 credits). Syllabus is common to all UG courses.

4. Value Education

A candidate shall be eligible for the award of the degree only if he/she has undergone the prescribed paper on value education. For three years UG degree Programme, a candidate must undergo value education during fourth semester of second year (2 credit). Paper will be finalized in due course.

PART – V Extension Activities

A candidate shall be awarded a maximum of 1 Credits for Compulsory Extension Service. All the Students shall have to enroll for NSS /NCC/ NSO (Sports & Games) Rotract / Youth Red cross or any other service organizations in the college and shall have to put in Compulsory minimum attendance of 40 hours which shall be duly certified by the Principal of the college before 31st March in a year. If a student LACKS 40 HOURS ATTENDANCE in the First year, he/she shall have to compensate the same during the subsequent years. Students those who complete minimum attendance of 40 hours in One year will get HALF A CREDIT and those who complete the attendance of 80 or more hours in Two Years will ONE CREDIT. Literacy and population Education Field Work shall be compulsory components in the above extension service activities. The working hours should not overlaps the normal teaching hours.

Student Advisor

All teachers of the department shall function as student advisors. There will be more or less an equal number of students assigned to each student advisor of a department. The student advisor will help the students in choosing core and elective papers of study. The student advisor shall be responsible for registration of papers (subjects) by his students. The student advisor will offer all possible student support services.

6. CREDITS

The term credit is used to describe the quantum of syllabus for various programmes in terms of periods of study. It indicates differential weightage given according to the contents duration of the courses in the curriculum design. The minimum credit requirement for a three year Bachelor's programme shall be 140 credits. Each subject (course) is designed variously under lectures / tutorials / laboratory work / seminar / project work etc., to meet effective teaching and learning needs and credits are assigned suitably.

One credit for each lecture / tutorial / project work period per week shall be allotted. One credit for two laboratory hours per week shall be allotted. In practical, each credit should cover minimum of six experiments. Thus normally, in each of the subject, credits will be assigned on the basis of the lectures / tutorials / laboratory work / project work and other forms of learning in a 15 week schedule.

B.Sc Mathematics Credits

Sl. No	Study Components	B.Sc.,		
		Number of Papers	Credits Per Paper	Total Credits
1	Language courses(Ic)	4	3	12
2	English language courses	4	3	12
3	Core Major Paper	8	5	40
4	Core Co-Major paper	7	4	28
5	Elective Papers	8	3	24
6	Part IV course:			
	a) Skill Enhancement course	6+1	6*2+1*1	12+1=13
	b) Foundation course	1	2	2
	d) Mathematics for Competitive Examinations	1	2	2
	e) Internship/Industrial Training	1	2	2
	f) Environmental studies	1	2	2
	g) Value Education	1	2	2
	Part V: Extension activities	1	1	1
				140

Sri Sankara Arts & Science College (Autonomous)
Department of Mathematics
Effective from the academic year 2023-2024
B.Sc., Mathematics

I Semester

Course Components /Title of the Paper	Credits	Ins Hours	CIA	EXT	Total
Part I-Language Paper-I (Tamil/Sanskrit)	3	6	25	75	100
Part II- English Paper-I	3	6	25	75	100
Part III Core Paper I: Algebra & Trigonometry	5	5	25	75	100
Core Paper II: Differential Calculus	5	5	25	75	100
Elective Course – I: Physics-I (or) Numerical Methods with Applications	3	4	25	75	100
Part IV Skill Enhancement Course – I: Financial Mathematics (or) Basic Tamil-I (or) Advanced Tamil-I Extended Professional Component (is apart of internal component only, Not to be included in the External Examination question paper)	2	2	25	75	100
Foundation Course: Bridge Mathematics	2	2	25	75	100
	23	30			

Sri Sankara Arts & Science College (Autonomous)
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Effective from the academic year 2023-2024
B.Sc., Mathematics

II Semester

Course Components /Title of the Paper	Credits	Ins Hours	CIA	EXT	Total
Part I-Language Paper-II (Tamil/Sanskrit)	3	6	25	75	100
Part II- English Paper-II	3	6	25	75	100
Part III Core Paper III: Analytical Geometry (Two & Three Dimensions)	5	5	25	75	100
Core Paper IV: Integral Calculus	5	5	25	75	100
Elective Course – II: Physics-II (or) Calculus of Finite Differences	3	4	25	75	100
<ul style="list-style-type: none"> • Practical Lab for Elective I & II (If Need, Refer NB*) 	-	-	40	60	100
Part IV Skill Enhancement Course – II: Basic Data Analysis using Excel (or) Basic Tamil-II (or) Advanced Tamil-II Extended Professional Component (is apart of internal component only, Not to be included in the External Examination question paper)	2	2	25	75	100
Skill Enhancement Course – III: Latex (or) Computational Mathematics Extended Professional Component (is apart of internal component only, Not to be included in the External Examination question paper)	2	2	25	75	100
	23	30			

NB*: Theory marks 100 convert it into 60 + Practical marks 100 convert it into 40 = 100	Theory	CIA: 25	EXT: 75	T: 100*60/100	T+P=100
	Practical	CIA: 40	EXT: 60	P: 100*40/100	

Sri Sankara Arts & Science College (Autonomous)
Department of Mathematics
Effective from the academic year 2023-2024
B.Sc., Mathematics

III Semester

Course Components /Title of the Paper	Credits	Ins Hours	CIA	EXT	Total
Part I-Language Paper-III	3	6	25	75	100
Part II- English Paper-III	3	6	25	75	100
Part III Core Paper V: Vector Calculus and Applications	5	5	25	75	100
Core Paper VI: Differential Equations and Applications	5	5	25	75	100
Elective Paper – III: Mathematical Statistics -Theory & Practical NB1*	3	4	T (60)	P (40)	100
Part-IV Skill Enhancement Course – IV: Entrepreneurial Based Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	1	1	25	75	100
Skill Enhancement Course – V: Statistics with R Programming (or) E-Commerce & Tally Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	2	2	25	75	100
Environment Studies	-	1	Exam will be held in IV Semester		
	22	30			

NB1*: Theory marks 100 convert it into 60 + Practical marks 100 convert it into 40 = 100	Theory	CIA: 25	EXT: 75	T: 100*60/100	T+P=100
	Practical	CIA: 40	EXT: 60	P: 100*40/100	

Sri Sankara Arts & Science College (Autonomous)
Department of Mathematics
Effective from the academic year 2023-2024
B.Sc., Mathematics

IV Semester

Course Components /Title of the Paper	Credits	Ins Hours	CIA	EXT	Total
Part I-Language Paper-IV	3	6	25	75	100
Part II- English Paper-IV	3	6	25	75	100
Part III Core Paper VII: Industrial Mathematics - Resource Management Techniques	5	5	25	75	100
Core Paper VIII: Elements of Mathematical Analysis	5	5	25	75	100
Elective Paper – IV: Transform Techniques	3	3	25	75	100
Part-IV Skill Enhancement Course – VI: Introduction to Data Science (or) Web Designing Extended Professional Component (is apart of internalcomponent only, Not to be included in the External Examination question paper)	2	2	25	75	100
Skill Enhancement Course – VII: Data Analysis using SPSS (or) Introduction to Artificial Intelligence Extended Professional Component (is apart of internalcomponent only, Not to be included in the External Examination question paper)	2	2	25	75	100
Environmental Studies	2	1	25	75	100
	25	30			

Sri Sankara Arts & Science College (Autonomous)
Department of Mathematics
Effective from the academic year 2023-2024
B.Sc., Mathematics

V Semester

Course Components /Title of the Paper	Credits	Ins Hours	CIA	EXT	Total
Part III Core Paper IX: Abstract Algebra	4	5	25	75	100
Core Paper X: Real Analysis	4	5	25	75	100
Core Paper XI: Optimization Techniques	4	5	25	75	100
Elective Paper – V: Programing in C (Theory & Practical) NB2*	3	4	T (60)	P (40)	100
Elective Paper – VI: Discrete Mathematics	3	4	25	75	100
Core Paper XII: Project with Viva-voce	4	5	40	60	100
Part-IV Value Education	2	2	25	75	100
Internship/Industrial Training (Do it in summer vacation at end of the IV semester)	2	-	25	75	100
	26	30			

NB2*: Theory marks 100 convert it into 60 + Practical marks 100 convert it into 40 = 100	Theory	CIA: 25	EXT: 75	T: 100*60/100	T+P=100
	Practical	CIA: 40	EXT: 60	P: 100*40/100	

Sri Sankara Arts & Science College (Autonomous)
Department of Mathematics
Effective from the academic year 2023-2024
B.Sc., Mathematics

VI Semester

Course Components /Title of the Paper	Credits	Ins Hours	CIA	EXT	Total
Part III- Core Paper XIII: Linear Algebra	4	6	25	75	100
Core Paper XIV: Complex Analysis	4	6	25	75	100
Core Paper XV: Mechanics	4	6	25	75	100
Elective Paper – VII: Programing in C++ (Theory & Practical) NB3*	3	5	T (60)	P (40)	100
Elective Paper-VIII: Graph Theory with Applications	3	5	25	75	100
Part -IV Professional Competency Skill Mathematics for Competitive Examinations & General Studies Extended Professional Component (is apart of internalcomponent only, Not to be included in the External Examination question paper)	2	2	25	75	100
Extension Activity	1	-	-	-	-
	21	30			

NB3*: Theory marks 100 convert it into 60 + Practical marks 100 convert it into 40 = 100	Theory	CIA: 25	EXT: 75	T: 100*60/100	T+P=100
	Practical	CIA: 40	EXT: 60	P: 100*40/100	

List of Electives I

1. Physics-I
2. Numerical Methods with Applications
3. Chemistry-I

List of Electives II

1. Physics-II
2. Calculus of finite differences
3. Chemistry-II

List of Electives

1. Mathematical Statistics
2. Transform Techniques
3. Programming language with practical (C)
4. Discrete Mathematics
5. Graph Theory with Applications
6. Programming language with practical (C++)

Title of the Course	Algebra & Trigonometry						
Paper Number	I						
Category	Core	Year Semester	I I	Credits	5	Course Code	
Pre-Requisite	An introduction to basic Algebra						
Objectives	<ul style="list-style-type: none"> ➤ Basic ideas on Theory of Equations, Matrices and Theory of Numbers. ➤ Knowledge to find expansions of trigonometry functions, solve theoretical and applied problems. ➤ To learn the base knowledge of CSIR/SET/PGTRB . 			Lect. Hrs	COs	Cognitive level	
Course Outline	UNIT-I Reciprocal Equations - Standard form – Increasing or decreasing the roots of a given equation – Removal of terms – Approximate solutions of roots of polynomials by Horner’s method – Related Problems. RTB(1): Chapter 6: Sections: 16, 16.1, 17, 19, 30			15	CO-1	K1 K3 K5	
	UNIT-II Summation of Series: Binomial – Exponential – Logarithmic series(Theorems without proof) – Related Problems. RTB(1): Chapter 3: Sections: 10 Chapter 4: Sections 3 to 7			15	CO-2 CO-3	K1 K3 K4	
	UNIT-III Characteristic equation – Eigen values and Eigen Vectors – Similar matrices - Cayley – Hamilton Theorem (Statement only) - Finding powers of square matrix– Inverse of a square matrix up to order 3 – Diagonalization of square matrices – Related Problems. RTB(2): Chapter 2: Sections: 16, 16.1 to 16.4			15	CO-3 CO-4	K1 K2 K3 K4	
	UNIT-IV Expansions of $\sin n\theta$, $\cos n\theta$ in powers of $\sin\theta$, $\cos\theta$ - Expansion of $\tan n\theta$ in terms of $\tan\theta$ – Expansions of $\cos^n\theta$, $\sin^n\theta$, $\cos^m\theta \sin^n\theta$ – Expansions of $\tan(\theta_1+\theta_2+\dots+\theta_n)$ – Expansions of $\sin\theta$, $\cos\theta$ and $\tan\theta$ in terms of θ – Related Problems. RTB(3): Chapter 2: Sections: 2.1, 2.1.1, 2.1.2 Chapter 3: Sections: 3.1, 3.1.1, 3.2.1, 3.4, 3.4.1 to 3.4.3			15	CO-4	K1 K2 K3 K5	
	UNIT-V Hyperbolic functions – Relation between circular and hyperbolic functions – Formulas in hyperbolic functions, Inverse hyperbolic functions – Logarithm of complex quantities, Summation of trigonometric series – Related Problems. RTB(3): Chapter 4: Sections: 4.1 to 4.7, Chapter: 5 Sections: 5.1 to 5.3. Chapter 6 Sections 6.1 to 6.6.			15	CO-5	K1 K2 K3 K4	
Total			75				

	S.No	Title of the Books	Authors	Publishers	Reprint Year
Recommended Text Books (RTB)	1	Algebra (Volume I)	T. K. Manicavachagam Pillay T.Natarajan K.S.Ganapathy	Viswanathan Publication	2014
	2	Algebra (Volume II)	T. K. Manicavachagam Pillay T.Natarajan K.S.Ganapathy	Viswanathan Publication	2008
	3	Trigonometry	P.Duraipandian and Kayalal Pachaiyappa	Muhul publishers	2009
Reference Books (RB)	1	Algebra	Dr.S.J.Venkatesan	Sri Krishna Publications, Chennai	2019
	2	Trigonometry	Dr.S.J.Venkatesan	Sri Krishna Publications, Chennai	2021
	3	Allied Mathematics	Venkatachalapathy S.G	Margham Publications.	2016
	4	Engineering Mathematics	Dr.M.K.Venkataraman	The National Publication Company	2000
	5	Engineering Mathematics	A.J.M.Spencer	EL/BS and Van Nostrand Reinhold (U.K) Co.LTD	1983
	6	Engineering Mathematics-I	G.Balaji	G,Balaji Publishers	2013
	7	Allied Mathematics Volume I	Duraipandian . P Udhayabaskaran S	S.Chand & Company Pvt. Ltd.	2016

Title of the Course	Differential Calculus						
Paper Number	II						
Category	Core	Year Semester	I I	Credits	5	Course Code	
Pre-Requisite	An introduction to basic differentiation						
Objectives	<ul style="list-style-type: none"> ➤ Basic knowledge on the notions of curvature, evolutes, involutes. ➤ The basic skills of differentiation, successive differentiation, and their applications. 				Lect. Hrs	COs	Cognitive level
Course Outline	UNIT-I Successive Differentiation: Introduction (Review of basic concepts) – The n^{th} derivative – Standard Results – Fractional Expressions – Trigonometrical Transformation – Formation of Equations Involving Derivatives – Leibnitz Formula for n^{th} Derivative of a Product (With out proof). RTB(1): Chapter 3: Sections: 1.1 – 1.6 and 2.1				15	CO-1	K1 K2 K3 K4 K5
	UNIT-II Partial Differentiation: Partial Derivatives – Successive Partial Derivatives – Function of a Function Rule – Total Differential Coefficient – A special case – Implicit Functions. RTB(1): Chapter: 8 Sections: 1.1 – 1.5				15	CO-2	K1 K2 K3 K4
	UNIT-III Partial Differentiation (Continued): Homogeneous Functions – Partial Derivatives of a Function of Two Variables – Maxima And Minima of Functions of Two Variables – Lagrange’s Method of Undetermined Multipliers. RTB(1): Chapter 8: Sections: 1.6, 1.7, 4 and 5				13	CO-3 CO-4	K1 K2 K3 K4
	UNIT-IV Envelope: Method of Finding Envelope – Another Definition of Envelope – Envelope of Family of Curves Which are Quadratic in the Parameter. RTB(1): Chapter: 10 Sections: 1.1 – 1.4				18	CO-4	K1 K2 K3 K4
	UNIT-V Curvature: Definition of a Curvature – Circle, Radius and Centre of Curvature – Evolutes and Involutives – Radius of Curvature in Polar Coordinates, $p - r$ equations; pedal equation of a curve. RTB(1): Chapter: 10 Sections: 2.1 – 2.7.				14	CO-5	K1 K2 K3 K4
Total					75		

	S.No	Title of the Books	Authors	Publishers	Reprint Year
Recommended Text Books (RTB)	1	Calculus Volume I	S.Narayanan T.K.Manicavachagom Pillay	S.Viswanathan (printers & Publishers) PVT LTD	2012
	1	Introduction to Calculus and Analysis (Volume - I &II)	R. Courant and F.John	Springer- Verlag Newyork, inc.,	1989
Reference Books (RB)	2	Calculus	Vasistha A.R Vasistha A.K	Krishna's Educational Publishers	2019
	3	Theory and problems of Differential and Integral Calculus	Frank Ayres	Schaums Outline Series, McGraw Hill Companies	1992
	4	Allied Mathematics Volumes I&II	Duraipandian P. Udayabaskaran S	Margam Publications	2005
	5	Differential Calculus	Dr.S.J.Venkatesan	Sri Krishna Publications, Chennai	2019
	6	Differential Calculus	Shanthi Narayanan P.K.Mittal	S.Chand & Co,	2018

Title of the Course	Numerical Methods with Applications							
Paper Number	I							
Category	Elective	Year	I	Credits	3	Course Code		
		Semester	I					
Pre-Requisite	12 th Standard Mathematics							
Objectives	<ul style="list-style-type: none"> ➤ To Solve Transcendental and Algebraic Equations. ➤ To understand the difference operators and their relations. ➤ To interpolate the given data using different methods. ➤ To use difference formula to compute derivatives and integrals. 					Lect. Hrs	COs	Cognitive level
Course Outline	UNIT-I The Solutions of Numerical Algebraic and Transcendental Equations: Introduction – Bisection method – Iteration method – Regula Falsi method – Newton – Raphson method – Horner’s Method. RTB(1): Chapter III: Sections: 1 to 5, 8					12	CO-2	K1 K3
	UNIT-II Simultaneous Linear Algebraic equations: Introduction – Gauss Elimination method – Computation of the inverse of a matrix using Gauss Elimination method – Method of Triangularisation – Iterative methods. RTB(1): Chapter IV: Sections: 1 to 4, 6					12	CO-5	K1 K3
	UNIT-III Finite Differences: Backward differences– central difference notations – Properties of the Operator Δ - Difference of polynomials – Factorial polynomials – The Operator E – Relation between E and Δ - Relation between D and Δ – Relation between the operators - Summation of Series. RTB(1): Chapter V: Sections: 6, 8, 10 – 12, 14 – 16, 18, 19					12	CO-4	K1 K3
	UNIT-IV Central Difference Interpolation Formulae: Gauss forward and backward interpolation formula – Stirling’s formula – Bessel’s formula. RTB(1): Chapter VII: Sections: 3 – 6					12	CO-1	K1 K3
	UNIT-V Interpolation with unequal intervals: Divided differences - properties of divided differences – Newton’s interpolation formula for unequal intervals -Lagrange’s interpolation formula. RTB(1): Chapter VIII: Sections 1 – 4					12	CO-3	K1 K3
Total						60		

	S.No	Title of the Books	Authors	Publishers	Reprint Year
Recommended Text Books (RTB)	1	Numerical Methods in Science and Engineering	Dr.M.K.Venkataraman	The National Publishing Company (Second Edition)	1992
	1	Numerical Methods with Programming in C	T. Veerarajan T. Ramachandran	Narosa Publishing House	2001
Reference Books (RB)	2	Introductory Methods of Numerical Analysis	S.S.Sastry	Margham Publications	2009
	3	Numerical Methods	S.Arumugam, A.Thangapandi Issac A.Somasundram,	Scitech Publications (India) PVT. LTD	2001
	4	Numerical Methods	Dr.P.Kandasamy Dr. K. Thilagavathy Dr. K. Gunavathy.	S.Chand and Company Ltd	2001
	5	Numerical Methods (Problems and Solutions)	M.K.Jain S.R.K.Iyengar R.K.Jain	New Age International (P) Limited, Publishers	2001
	6	Numerical Methods	Dr.G.Balaji	Balaji Publications	2018
	7	Numerical Methods	Dr. A.Singaravelu	Meenakshi Agency	2017

Title of the Course		FINANCIAL MATHEMATICS					
Paper Number		SKILL ENHANCEMENT COURSE - I					
Category	SEC	Year	I	Credits	2	Course	
		Semester	I			Code	
Pre-requisite		12 th Standard Mathematics					
Objectives of the Course		<ul style="list-style-type: none"> • Understand the concept of time value of money and its applications in finance • Analyse different types of annuities and calculate their present and future values • Understand the principles of bond valuation and pricing • Analyse different types of stocks and evaluate their performance • Understand the principles of option valuation and hedging 					
Course Outline		<p>Unit – I: Time Value of Money: Simple & Compound Interest, Present Value & Future Value, Annuities & Perpetuities Hours: 6</p> <p>Unit – II: Bonds: Net Present Value and Internal Rate of Return, Price and Yield of a Bond, Term Structure, Duration, Immunization Hours: 6</p> <p>Unit – III: Stocks: Common Stock Valuation, Preferred Stock Valuation, Stock Price Validity Hours: 6</p> <p>Unit – IV: Stock Price Models: Geometric Brownian Motion, Binomial Tree Hours: 6</p> <p>Unit – V: Options: Option Basics, Option Pricing Models, Option Trading Strategies Hours: 6</p>					

<p>Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)</p>	<p>Total Hours:30</p> <p>Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved</p> <p>(To be discussed during the Tutorial hour)</p>
<p>Skills acquired from this course</p>	<p>Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</p>
<p>Recommended Text</p>	<p>1. An Introduction to Mathematics of Finance: A Deterministic Approach by Stephen Garrett.</p> <p>2. An Elementary Introduction to Mathematical Finance by Sheldon. M. Ross</p>
<p>Reference Books</p>	<p>1. Mathematics for Finance by M. Capinski and T. Zastawniak, Springer (International Edition), 2003</p> <p>2. The Calculus of Finance by Amber Habib, Universities Pres, 2011</p> <p>3. Options, Futures and Other Derivatives, 7th Edition by John C. Hull and Sankarshan Basu, Pearson 2009</p> <p>4. Investment Science by David Luenberger, Oxford University Press (Indian Edition), 1997</p>
<p>Website and e-Learning Source</p>	<p>1. https://ocw.mit.edu/courses/15-401-finance-theory-i-fall-2008/</p> <p>2. Investopedia Financial-Education: https://www.investopedia.com/financial-education-4689775 EC – Financial Mathematics</p> <p>3. https://www.edx.org/course/financial-analysis-decision-making-0</p>

Title of the Course	Bridge Mathematics						
Paper Number	Foundation Course						
Category	Elective	Year	I	Credits	2	Course Code	
		Semester	I				
Pre-Requisite	An introduction to Numerical Methods						
Objectives	<ul style="list-style-type: none"> ➤ To learn about the basic ideas of Numerical Methods. ➤ To teach the concept of basic numerical methods. ➤ After the completion of the course the student will be able to solving problem on numerical differentiation, numerical integration and solution to ordinary differential equations. 				Lect. Hrs	COs	Cognitive level
Course Outline	UNIT-I Algebra: Binomial theorem, General term, middle term, problems based on these concepts.				6	CO-2	K1 K3
	UNIT-II Sequences and series (Progressions). Fundamental principle of counting. Factorial n.				6	CO-5	K1 K3
	UNIT-III Permutations and combinations, Derivation of formulae and their connections, simple applications, combinations with repetitions, arrangements within groups, formation of groups.				6	CO-4	K1 K3
	UNIT-IV Trigonometry: Introduction to trigonometric ratios, proof of $\sin(A+B)$, $\cos(A+B)$, $\tan(A+B)$ formulae, multiple and sub multiple angles, $\sin(2A)$, $\cos(2A)$, $\tan(2A)$ etc., transformations sum into product and product into sum formulae, inverse trigonometric functions, sine rule and cosine rule.				6	CO-1	K1 K3
	UNIT-V Calculus: Limits, standard formulae and problems, differentiation, first principle, uv rule, u/v rule, methods of differentiation, application of derivatives, integration - product rule and substitution method.				6	CO-3	K1 K3
Total				30			
* Extended Professional Component (is apart of internal component only, Not to be included in the External Examination question paper)							

Recommended Text Book	<ol style="list-style-type: none"> 1. NCERT class XI and XII text books. 2. Any State Board Mathematics text books of class XI and XII
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Title of the Course	Analytical Geometry (Two & Three Dimensions)						
Paper Number	III						
Category	Core	Year	I	Credits	5	Course Code	
		Semester	II				
Pre-Requisite	An introduction to basic knowledge in geometry						
Objectives	<ul style="list-style-type: none"> ➤ Necessary skills to analyze characteristics and properties of two – and three – dimensional geometric shapes. ➤ To present mathematical arguments about geometric relationships. ➤ To learn the base knowledge of CSIR/SET/PGTRB 				Lect. Hrs	COs	Cognitive level
Course Outline	UNIT-I: Polar and pole, conjugate points and conjugate lines – diameters – conjugate diameters of an ellipse. – semi diameters –conjugate diameters of hyperbola. RTB(1): Chapter 7: Sections: 7.2, 7.3, Chapter 8: Sections: 8.2 – 8.5.				15	CO-1 CO-2 CO-4	K1 K2 K4 K5 K6
	UNIT-II: Polar coordinates: General polar equation of straight line – Polar equation of a circle given a diameter, Equation of a straight line, circle, conic – Equation of chord, tangent, normal. Equations of the asymptotes of a hyperbola. RTB(1): Chapter 10: Sections: 10.1 – 10.8.				15	CO-2	K1 K2 K3 K4 K5
	UNIT-III: The plane – Transformation to the normal form – Determination of a plane under given conditions – System of Planes – Two sides of a plane – Length of the perpendicular from a point to a plane – Joint equation of two planes – Orthogonal projection on a plane. RTB(2): Chapter 2: Sections: 2.3 – 2.9.				15	CO-2 CO-3 CO-4	K1 K2 K4 K5 K6
	UNIT-IV: Representation of line – line and a plane - co-planar lines – constants in the equations of a straightline – the shortest distance between two skew lines - Length of the perpendicular from a point to a line - intersection of three planes. RTB(2): Chapter 3: Sections: 3.1 to 3.8.				15	CO-2 CO-4	K1 K2 K4 K6
	UNIT-V: Equation of a sphere – Definition – the sphere through four given points - Section of a sphere by a plane - equation of a circle - tangent plane - angle of intersection of two spheres- condition for the orthogonality of two spheres - radical plane. RTB(2): Chapter 6: Sections: 6.1 – 6.8.				15	CO-5	K1 K2 K4 K5 K6
Total					75		

	S. No	Title of the Books	Authors	Publishers	Reprint Year
Recommended Text Books (RTB)	1	Analytical Geometry of 2D	P.Duraipandian	Muhil Publishers	2010
	2	Analytical solid Geometry of 3D	Shanthi Narayan Dr. P. K. Mittal	S. Chand &Co Pvt Ltd	2019
Reference Books (RB)	1	Analytical Geometry 2D&3D	D.Chatterjee	Narosa publishing House	2009
	2	Calculus and Analytical Geometry	Thomas /Finney	Narosa publishing House	1998
	3	A Hand Book of Analytical Geometry 2-D	M.R.Joshi Pratik Parashar Sharma Sakar Raj Pahadi	Vidhyarthi Publication	2013
	4	Analytical Geometry (2 Dimensions& 3 Dimensions)	VenkatachalapathyS.G	Margham Publications	2010
	5	Textbook of Analytical Geometry	P.K.Jain	New Age International Publishers	2000
	6	Algebra Analytical Geometry(2D) and Trigonometry	Sudha.S	Emerald Printing House Pvt. Ltd, Chennai	1998
	7	Application of calculus(First Edition)	Debasish Sengupta	Arunabha sen Books and Allied P.Ltd, Kolkata.	2012

Title of the Course	Integral Calculus							
Paper Number	IV							
Category	Core	Year	I	Credits	5	Course Code		
		Semester	II					
Pre-Requisite	An introduction to Basic Integration							
Objectives	<ul style="list-style-type: none"> ➤ To learn basic formulas in integration ➤ To learn applications of integration ➤ To learn double and triple integration and its applications 					Lect. Hrs	Cos	Cognitive level
Course Outline	UNIT-I: Reduction formulae -Types, integration of product of powers of algebraic and trigonometric functions, integration of product of powers of algebraic and logarithmic functions – product of powers of exponential and trigonometric functions - Bernoulli’s formula. RTB(1): Chapter 1: Sections: 13, 13.1 to 13.10, 14,15.1					15	CO-1	K1 K2 K3 K4 K5
	UNIT-II: Multiple Integrals - definition of double integrals - evaluation of double integrals – double integrals in polar coordinates. RTB(1): Chapter 5: Sections: 1, 2.1, 2.2, 3.1.					15	CO-2	K1 K2 K3 K4 K5
	UNIT-III: Triple integrals – applications of multiple integrals – volumes of solids of revolution – Volume of solids as double intergrals – Volume as a triple integral - areas of curved surfaces – change of variables – Jacobian – change of variable in the case of two varibles, three variables – transformation from cartesian to polar coordinates and Cartesian to spherical polar coordinates. RTB(1): Chapter 5: Sections: 4, 5.1 to 5.3, 6.2, 6.3, & 7 Chapter 6: Sections: 1.1, 1.2, 2.1 – 2.4					15	CO-3	K1 K2 K3 K4 K5
	UNIT-IV: Beta and Gamma functions – infinite integral – definitions – recurrence formula of Gamma functions – properties of Beta functions - relation between Beta and Gamma functions – Applications. RTB(1): Chapter 7: Sections: 1.1 to 1.4, 2.1, 2.3, 3 to 6					15	CO-4	K1 K2 K3 K4 K5
	UNIT-V: Geometric Applications of Integrations: Areas in polar co-ordinate, Trapezoidal Rule, Simpson’s Rule, Length of a curve – Cartesian co-ordinate – Polar co-ordinate –Area of surface of revolution. RTB(1): Chapter 2: Sections: 1.4, 2.1, 2.2, 4, 4.1, 4.2 &5					15	CO-5	K1 K2 K3 K4 K5
	Total					75		

	S.No	Title of the Books	Authors	Publishers	Reprint Year
Recommended Text Books (RTB)	1	Calculus (Volume-II)	S.Narayanan T.K.Manicavachagom Pillay	S.Viswanathan (printers & Publishers) PVT LTD	2016
	1	Calculus	H. Anton I. Birens and T. Davis	John Wiley and Sons,inc.,	2002
Reference Books (RB)	2	Integral Calculus	Shanti Narayan	S.Chand Company Limited	2019
	3	Engineering Mathematics-I	Dr.A.Singaravel	Meenakshi Agency	2009
	4	Engineering Mathematics-III-A	Dr.M.K.Venkataraman	The National Publication Company	1999
	5	Advanced Engineering Mathematics	Dass H. K	S.Chand & Company Pvt. Ltd.	2006
	6	Theory and problems of Differential and Integral Calculus	Frank Ayres	Schaums Outline Series, McGraw Hill Companies	1992
	7	Vector Calculus	S.Bala	A.R.S. Publications	2015

Title of the Course	Calculus of Finite Differences						
Paper Number	II						
Category	Elective	Year	I	Credits	3	Course Code	
		Semester	II				
Pre-Requisite	12th Standard Mathematics						
Objectives	<ul style="list-style-type: none"> ➤ To introduce students to numerical differentiation and integration. ➤ To teach students how to solve difference equations. ➤ To familiarize students with the concept of Numerical solution of ordinary differential equations. ➤ To learn the base knowledge of CSIR/SET/PGTRB 				Lect. Hrs	COs	Cognitive level
Course Outline	UNIT-I Numerical differentiation: Derivatives using Newton's forward and backward difference formulae – derivatives using sterling's formula – derivatives using divided difference formula – Simple Problems. RTB(1): Chapter 7: Sections:7.1 – 7.4[Omit 7.5 and 7.6]				12	CO-1 CO-2 CO-3 CO-5	K1 K2 K5 K6
	UNIT-II Numerical Integration: General quadrature formula – Trapezoidal rule - Simpson's one third rule – Simpson's three- eight rule – Weddle's rule – Simple Problems. RTB(1): Chapter 7: Sections: 7.7 – 7.11, 7.13 – 7.15 [Omit7.12]				12	CO-4	K1 K2 K5 K6
	UNIT-III Difference equation: Definition – order and degree of a difference equation - Linear difference equation – Complementary function and particular integral of $f(E)y_x = \phi(x)$. RTB(1): Chapter 8: Sections: 8.1 – 8.6				12	CO-1	K1 K2 K5 K6
	UNIT-IV Numerical solution of ordinary differential equations (I order only) Taylor's series method – Picard's method – Euler's method – Simple Problems. RTB(1): Chapter 9: Sections: 9.5 – 9.7				12	CO-3 CO-4	K1 K2 K5 K6
	UNIT-V Numerical solution of ordinary differential equations (I order only) Modified Euler's method – Runge – kutta method forth order only - Simple Problems. RTB(1): Chapter 9: Sections: 9.9 – 9.11				12	CO-5	K1 K2 K5 K6
Total					60		

	S.No	Title of the Books	Authors	Publishers	Reprint Year
Recommended Text Books (RTB)	1	Calculus of finite differences and Numerical Analysis	Dr.P.Kandasamy Dr. K. Thilagavathy	S.Chand and Co Pvt., Ltd.,	2003
	1	Calculus of finite differences and Numerical Analysis	Gupta Malik	Krishna Prakastan Mandir, Meerat.	2019
Reference Books (RB)	2	Numerical Methods	Dr. A.Singaravelu	Meenakshi Agency	2017
	3	Numerical Methods (Problems and Solutions)	M.K.Jain S.R.K.Iyengar R.K.Jain	New Age International (P) Limited, Publishers	2001
	4	Numerical Methods	S.Arumugam, A.Thangapandi Issac A.Somasundram,	Scitech Publications (India) PVT. LTD	2001
	5	Introductory Methods of Numerical Analysis	S.S.Sastry	Margham Publications	2009
	6	Numerical Methods with Programmin g in C	T. Veerarajan T. Ramachandran	Narosa Publishing House	2001
	7	Numerical Methods	Dr.G.Balaji	Balaji Publications	2018

Title of the Course		BASIC DATA ANALYSIS USING EXCEL					
Paper Number		SKILL ENHANCEMENT COURSE II					
Category	SEC	Year	I	Credits	2	Course Code	
		Semester	II				
Instructional Hours per week		Lecture		Tutorial		Lab Practice	Total
		2		--		--	2
Pre-requisite		12 th Standard Mathematics					
Objectives of the Course		<ul style="list-style-type: none"> • Understand the basic features of Microsoft Excel • Understand basic data analysis using Excel • Learn Basic Excel functions and formulas 					
Course Outline		<p>Unit I: Introduction to Excel: Spreadsheet window pane, Title Bar, Menu Bar, Standard toolbar, Formatting toolbar, the ribbon, file tab and backstage view, Formula bar, Workbook window, Status bar, Task pane, workbook and sheets, columns and rows, selecting rows and columns, changing column width and row height, auto fitting rows and columns, hiding/unhiding columns and rows, inserting and deleting rows and columns, cell address of a cell, components of a cell, format value, formula, use of paste and paste special. Hours: 6</p>					
		<p>Unit II: Creating formula, using formula, formula function, sum, average, if, count, max, min, proper, upper, lower, using Autosum, Advance formulas – concatenate, Vlookup, Hlookup, Match, Countif, Text, Trim Functions. Hours:6</p>					
		<p>Unit III: Data Handling Wizards, Sort, Filter, Text to Columns, Remove Duplicates, Consolidate, Data validation. Hours: 6</p>					
		<p>Unit IV: Creating pivot tables, manipulating a pivot table, using the pivot table toolbar, changing data field, properties, displaying a pivot chart, setting pivot table options, adding subtotals to pivot tables. Hours: 6</p>					
		<p>Unit V: Creating charts, different types of charts, formatting chart objects, changing chart types, showing and hiding the legend, showing and hiding the data table. Hours: 6</p>					

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	<p style="text-align: right;">Total Hours: 30</p> <p>Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved</p> <p>(To be discussed during the Tutorial Hour)</p>
Skills acquired from this course	<p>Knowledge, Problem Solving, Analytical Ability, Professional Competency, Professional Communication and Transferrable Skill</p>
Recommended Text	<p>Data Analysis with Excel – Manish Nigam, BPB Publications</p>
Reference Books	<ol style="list-style-type: none"> 1. Excel 2022 Bible by John Walkenbach 2. Excel 2022 All-in-one for Dummies by Greg Harvey
Website and e-Learning source	<ol style="list-style-type: none"> 1. https://support.microsoft.com/en-us/excel Exceljet: https://exceljet.net/ 2. https://www.excel-easy.com

Title of the Course		COMPUTATIONAL MATHEMATICS					
Paper Number		SKILL ENHANCEMENT COURSE III					
Category	SEC	Year	I	Credits	2	Course Code	
		Semester	II				
Instructional Hours per week		Lecture		Tutorial		Lab Practice	Total
		2		--		--	2
Pre-requisite		12 th Standard Mathematics					
Objectives of the Course		<ul style="list-style-type: none"> • To introduce students to computational mathematics and its applications in solving mathematical problems • To familiarize students with basics of Scilab programming language and its use in numerical computations • To teach students how to implement numerical algorithms for solving mathematical problems using Scilab. • To enable students to use computational methods to solve mathematical problems and interpret results obtained 					
Course Outline		Unit I: Data in Scilab: Data Objects in base Scilab (Scalars, characters, arrays, strings, cell arrays, structures, excluding tables), Variables – Assignment Statements – System Variables – Accessing Data Elements – Examples of Joining Data Sets – Data Import and Export – Text Files – Comma – Separated Values (CSV) files – Spreadsheet Files Hours: 6					
		Unit II: Functions in Scilab: Introduction – Syntax for definition and use – Workspace – Directory (dir) – Change Directory (cd) – Copy File (copyfile) – Delete File (delete) – What Function (what) – Who Function (who) – Whos Function (whos) – Which Function (which) – Clear Function (clear) – Close Function (close) – Clear CommandWindow (clc) – Path Commands – Punctuation – Arithmetic Operators Hours: 6					

	<p>Unit III: Visualizing Data: Basics: Graph2D – Graph 3D – PlotFunction (2D, 3D, Scatter Plots) – Simple Plot Editing – Plots in 2D – Adding Title – Labels – Legends – Fplot – Logarithmic plots – Plotyy – Axis and Axes Commands – Subplot Function – Ginput – Discrete Plots Using Stem, Stair, Statistical Plots</p> <p style="text-align: right;">Hours: 6</p>
	<p>Unit IV: Numerical Methods Using Scilab: Bisection Method – Newton Raphson Method – Regula falsi Method – Secant Method – Finite Difference Operators – Newton Gregory Forward Interpolation Method – Newton’s Gregory Backward Interpolation Method – Lagrange Interpolation Method</p> <p style="text-align: right;">Hours: 6</p>
	<p>Unit V: Numerical Differentiation & Integration Using Scilab: Numerical Differentiation – Equal Interval, Unequal Interval – Numerical Integration – Newton Cotes Formula – Trapezoidal Rule – Simpson’s 1/3rd Rule – Simpson’s 3/8th Rule – Monte Carlo Method</p> <p style="text-align: right;">Hours: 6</p>
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	<p style="text-align: right;">Total Hours: 30</p> <p>Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved (To be discussed during the Tutorial Hour)</p>
Skills acquired from this course	Knowledge, Problem Solving, Analytical Ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	<ol style="list-style-type: none"> 1. SCILAB (A Free Software to MATLAB) – Author Achuthsankar S Nair & Hema Ramachandran, S. Chand Publishing, 2012, Unit (1,2,3) 2. Numerical Methods KIT for MATLAB, SCILAB & OCTAVE USERS by Rohan Verma, Units (4,5) Chapters (1,2,4,5) 3. Computer Based Numerical & Statistical Techniques, M. Goyal, Infinity Science Press LLC
Reference Books	<ol style="list-style-type: none"> 1. Introduction to Scilab: For Engineers and Scientists, Sandeep Nagar 2. Computing in Scilab – Chetan Jain- Cambridge University
Website and e-Learning source	<ol style="list-style-type: none"> 1. https://www.scilab.org/tutorials 2. https://www.edx.org/course/scilab-programming-for-beginners

Title of the Course		LATEX					
Paper Number		SKILL ENHANCEMENT COURSE III					
Category	SEC	Year	I	Credits	2	Course Code	
		Semester	II				
Instructional Hours per week		Lecture		Tutorial		Lab Practice	Total
		2		--		--	2
Pre-requisite		12 th Standard Mathematics					
Objectives of the Course		<ul style="list-style-type: none"> To enable the students to acquire basic concepts of LaTeX To get knowledge to prepare sample reports, sample articles, sample presentation and sample poster 					
Course Outline		Unit I: Preamble : Motivation - Running LaTeX - Resources – Basic LaTeX - Sample Document and Key Concepts - Type Style - Environments - Lists - Centering - Tables - Verbatim - Vertical and Horizontal Spacing Hours: 6					
		Unit II: Typesetting Mathematics - Examples - Equation Environments - Fonts, Hats, and Underlining - Braces -Arrays and Matrices - Customized Commands -Theorem-like Environments – Math Miscellany - Math Styles - Bold Math - Symbols for Number Sets - Binomial Coefficient Hours: 6					
		Unit III: Further Essential LaTeX: Document Classes and the Overall Structure - Titles for Documents - Sectioning Commands - Miscellaneous Extras - Spacing - Accented Characters – Dashes & Hyphens - Quotation Marks - Troubleshooting – Pinpointing the Error - Common Errors - Warning Messages Hours: 6					
		Unit IV: Packages - Inputting Files - Inputting Pictures - Making a Bibliography - Making an Index –Latex through the years Hours: 6					
		Unit V: Sample Article –Sample Report – Sample presentation – Sample Poster – Internet Resources Hours: 6					

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	<p style="text-align: right;">Total Hours: 30</p> <p>Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved</p> <p>(To be discussed during the Tutorial Hour)</p>
Skills acquired from this course	<p>Knowledge, Problem Solving, Analytical Ability, Professional Competency, Professional Communication and Transferrable Skill</p>
Recommended Text	<p>Learning LaTeX : David F. Griffiths, Desmond J. Higham. - SIAM - Society for Industrial and Applied Mathematics, Philadelphia</p> <p>Chapter 1 ,2,3,4 and 5</p>
Reference Books	<ol style="list-style-type: none"> 1. A Guide to LaTeX, Helmut Kopka Patrick W. Daly, Electronic Publishing (Fourth edition) © Addison Wesley Longman Limited 2004. 2. LaTeX Tutorials, A PRIMER, Indian TEX Users Group, Trivandrum, India 2003 September 3. LaTeX Beginner's Guide, Stefan Kottwitz, Published by Packt Publishing Ltd. 32 Lincoln road Olton, Birmingham, B27 6PA, UK
Website and e-Learning source	<ol style="list-style-type: none"> 1. Overleaf: https://www.overleaf.com/ 2. ShareLaTeX: https://www.sharelatex.com/ 3. LaTeX Wikibook: https://en.wikibooks.org/wiki/LaTeX

Title of the Course		ENTREPRENEURIAL DEVELOPMENT COURSE					
Paper Number		SKILL ENHANCEMENT COURSE IV					
Category	SEC	Year	II	Credits	1	Course Code	
		Semester	III				

Entrepreneurial Cell of the concerned colleges will give job-oriented training to the students.

Title of the Course	Vector Calculus and Applications					
Paper Number	V					
Category	Core	Year	II	Credits	5	Course Code
		Semester	III			
Pre-Requisite	12th Standard Mathematics					
Objectives	<ul style="list-style-type: none"> ➤ Knowledge about differentiation of vectors and on differential operators. Knowledge about derivatives of vector functions. ➤ Skills in evaluating line, surface and volume integrals. ➤ The ability to analyze the physical applications of derivatives of vectors. 			Lect. Hrs	COs	Cognitive level
Course Outline	UNIT-I Scalar and Vector point function – level surfaces – Directional Derivative of a scalar point functions – Gradient of a scalar point function – Summation notation for gradient – Gradient of $f(r)$. RTB(1): Chapter 2: Sections: 2.1 – 2.6			15	CO-1 CO-2	K1 K2 K4 K5 K6
	UNIT-II Divergence and curl of a vector point function – Summation notation for divergence and curl – Laplacian differential operators, other differential operators, divergence and curl of a gradient and divergence and curl of a curl – Examples. RTB(1): Chapter 2: Sections: 2.7 – 2.13			15	CO-1 CO-2 CO-3 CO-4	K1 K2 K4 K5 K6
	UNIT-III Line integrals, independence of path of integration, conservative field and scalar potential, line integral of a conservative vector. RTB(1): Chapter 3: Sections: 3.1 – 3.4			15	CO-1 CO-4	K1 K2 K4 K5 K6
	UNIT-IV Surface integrals - Volume integrals – Cylindrical and spherical polar coordinates. RTB(1): Chapter 3: Sections: 3.5 – 3.7			15	CO-1 CO-2 CO-3	K1 K2 K4 K5 K6
	UNIT-V Integral theorems, Gauss' divergence Theorem, Integral theorems derived from the divergence theorem, Green's theorem in plane - Stoke's Theorem – simple problems RTB(1): Chapter 4: Sections: 4.1 – 4.5			15	CO-1 CO-5	K1 K2 K4 K5 K6
	Total			75		

Recommended Text Books (RTB)	S.No	Title of the Books	Authors	Publishers	Reprint Year
	1	Vector Analysis	P. Duraipandian Kayalal Pachaiyappa	S. Chand &Co	2015
Reference Books (RB)	1	A Text Book of Vector Calculus	Shanti Narayan J. N Kapur	S. Chand & Company Ltd	1998
	2	Theory and Problems of Vector Analysis(2 nd Edition)	Murray R. Spiegel	Schaum's Outline Series	1974
	3	Vector Analysis	K. Viswanatham S. Selvaraj	Emerald Publishers	1984
	4	Vector Calculus	S.Bala	A.R.S. Publications	2015
	5	Vector Calculus	T.K.ManichavagomPilay T.Natarajan	S.Viswanathan (printers & Publishers) PVT LTD	1997
	6	Advanced Engineering Mathematics	H. K Dass	S. Chand & Company Ltd	2001
	7	Engineering Mathematics	Dr. M. K Venkataraman	The National Publishing Company	1992

Title of the Course	Differential Equations and Applications						
Paper Number	VI						
Category	Core	Year	II	Credits	5	Course Code	
		Semester	III				
Pre-Requisite	12th Standard Mathematics						
Objectives	<ul style="list-style-type: none"> ➤ Knowledge about the methods of solving Ordinary and Partial Differential Equations. ➤ The understanding of how Differential Equations can be used as a powerful tool in solving problems in science ➤ To learn the base knowledge of PGTRB/TNPSC 				Lect. Hrs	COs	Cognitive level
Course Outline	UNIT-I Equations of the first order and of the first degree: Variable Separable – Homogeneous Equation – Non-Homogeneous Equation of First Degree in two Variables – Linear Equation – Bernoulli’s Equation – Exact Differential Equations. RTB(1): Chapter 2: Sections: 1 – 6.1				15	CO-1	K1 K2 K3 K5
	UNIT-II Equation Of First Order But Not Of Higher Degree: Equation Solvable for dy/dx – Equation Solvable for y – Equation Solvable for x – Clairauts Form – Linear Equations with Constant Coefficients – Particular Integrals of Algebraic, Exponential, Trigonometric Functions and Their Products. RTB(1): Chapter 4: Sections: 1, 2.1, 2.2, 3.1, Chapter 5: Sections: 4, 5				15	CO-2	K1 K2 K3 K5
	UNIT-III Simultaneous Linear Differential Equations: Linear Equation of the Second Order – Complete Solution in Terms of a Known Integrals – Reduction to Normal Form – Change of the Independent Variable – Method of Variation of Parameters. RTB(1): Chapter 6:Section: 6,Chapter 8:Sections:1–4				15	CO-1 CO-2 CO-3	K1 K2 K3 K5
	UNIT-IV Partial Differential Equations: Complete Integral – Singular Integral – General Integral - Formation of PDE by Eliminating Arbitrary Constants and Arbitrary Functions – Lagrange’s Linear Equations – Simple Applications. RTB(1): Chapter 12: Sections: 1, 2, 3.1, 3.2 and 4				15	CO-5	K1 K2 K3 K5
	UNIT-V Special Methods: Standard Forms – Charpit’s Method – Simple Applications. RTB(1): Chapter 12: Sections: 5.1, 5.2, 5.3, 5.4 and 6				15	CO-4	K1 K2 K3 K5
	Total				75		

	S.No	Title of the Books	Authors	Publishers	Reprint Year
Recommended Text Books (RTB)	1	Differential Equations and its Applications	S.Narayanan and T.K.Manickavachogom Pillay	S.Viswanathan Publishers Pvt.Ltd.	2011
	1	Differential Equations	Dr.S.J.Venkatesan	Sri Krishna Publications, Chennai	2019
Reference Books (RB)	2	Differential Equations	S.L.Ross	John Wiely	1984
	3	Differential Equations	N.P.Bali	Laxmi Publications Ltd	2004
	4	Engineering Mathematics (Volume I)	P.Kandasamy	S.Chand Company LTD	2001
	5	Concepts of Functions & Calculus	Vikas Rahi	The Tata McGraw Hill Companies	2009
	6	Theory and problems of Differential and Integral Calculus	Frank Ayres	Schaums Outline Series, McGraw Hill Companies	1992
	7	Differential Equations with Applications and Historical Notes	G.F. Simmons	TaTa McGraw-Hill Edition	2008

Title of the Course	Mathematical Statistics							
Paper Number	III							
Category	Elective	Year	II	Credits	3	Course Code		
		Semester	III					
Pre-Requisite	12th Standard Mathematics							
Objectives	<ul style="list-style-type: none"> ➤ To understand and apply statistical tools in Business ➤ Analyzing the data and drawing conclusions from it ➤ To learn the base knowledge of CSIR/SET/PGTRB 					Lect. Hrs	COs	Cognitive level
Course Outline	UNIT-I Statistics – definition – Limitations - Methods of data collection – classification – Tabulation – Frequency distributions. RTB(1): Part II: Chapter 1, 2, 3					12	CO-1	K1 K2 K5 K6
	UNIT-II Measures of Central tendency – Mean, Median, Mode, Geometric Mean, Harmonic Mean – Problems. Measures of Dispersion – Range, Quartile deviation, Standard deviation, Coefficient of Variation – Problems. RTB(1): Part II: Chapter 5, 6					12	CO-2 CO-3	K1 K2 K5 K6
	UNIT-III Simple Correlation – Rank Correlation – Regression Equation – Curve fitting – Principle of Least square – Fitting a straight line. RTB(1): Part I: Chapter 8, 9, 10.1					12	CO-1 CO-3	K1 K2 K5 K6
	UNIT-IV Sampling distribution – Test of hypothesis – Test of significance based on large samples – Test for Mean and Proportion – Confidence interval. RTB(1): Part I: Chapter 24 : Page No. 24.1 - 24.35, 24.44 - 24.46					12	CO-2 CO-4	K1 K2 K5 K6
	UNIT-V Small samples - Student ‘t’ test, F-test, Chi-square test – ANOVA – One way and Two way classification. RTB(1): Part I: Chapter 25, 26, 27					12	CO-5	K1 K2 K5 K6
Total						60		

Recommended Text Books (RTB)	S.No	Title of the Books	Authors	Publishers	Reprint Year
	1	Mathematical Statistics	P.R.Vittal	Margham Publications	2010
Reference Books (RB)	1	Statistics theory and Practice	R.S.N Pillai Bagavathi	S.Chand	2008
	2	Mathematics Statistics	J.N.Kapur H.C.Saxena	S.Chand	2019
	3	Statistical Methods	S.P.Gupta	Sultan Chand and sons	2016
	4	Fundamentals of Mathematical Statistics	S.C.Gupta & V.K.Kapoor	Sultan Chand and sons	2019
	5	Mathematical Statistics with Applications	Wackerly Mendenhall Scheaffer	Cengage Learning Inc	2015
	6	Statistics and Numerical Methods	G. Balaji	G. Balaji Publishers	2012
	7	Fundamentals of Statistics Volume I & II	Goon A.M., Gupta M.K. and Dasgupta B.	8 th Edn. The World Press, Kolkata.	2002

Mathematical Statistics

List of Practicals

Semester – III

UNIT I

Frequency distribution – Univariate & Bivariate frequency table.

UNIT II

Measure of Central tendency and Measure of Dispersion.

UNIT III

Correlation - Rank Correlation – Regression – Fitting of straight line.

UNIT IV

Large Sample Tests – Test for Mean & proportion

Small Sample Tests – t, F, Chi-square test.

UNIT V

ANOVA – One way and two-way classification.

Title of the Course		STATISTICS WITH R PROGRAMMING					
Paper Number		SKILL ENHANCEMENT COURSE V					
Category	SEC	Year	II	Credits	2	Course Code	
		Semester	III				
Instructional Hours per week		Lecture		Tutorial		Lab Practice	Total
		2		--		--	2
Pre-requisite		12 th Standard Mathematics					
Objectives of the Course		<ul style="list-style-type: none"> • To analyze data using the statistical tool R. • To create vectors, lists, matrices, arrays and data frames using R. • To draw charts and graphs using R. • To automate data analysis, working collaboratively and openly on code. • To know how to generate dynamic documents. 					
Course Outline		Unit I: Features of R- -Reserved words –Identifiers – Constants – Variables - Operators -Operator Precedence –Strings- Basic Data Types Hours: 6					
		Unit II: Creating and combining vectors -Accessing Vector Elements – Modifying Vectors-Vector arithmetic and Recycling -Vector Element Sorting –Reading Vectors -Creating Lists -Accessing List elements - Updating List Elements - Merging Lists -List to Vector conversion Hours: 6					
		Unit III: Creating matrices -Creating Arrays -Creating factors - Creating Data Frames -Aggregating Data -Sorting Data -Merging Data -Reshaping data -Sub-setting data -Data Type Conversion Bar charts– Histogram – Line graphs – Pie charts– Graphical analysis and summaries of Data using Descriptive Statistics Hours: 6					
		Unit IV: Decision making (using if statement - if...else statement - Nested If...Else statement - if else function - Switch statement) -Loops (for loop – while Loop – repeat Loop) -Function definition and Function Calling – Function without arguments - Built-in functions Hours: 6					
		Unit V: Probability distribution – Z test – F –test – t test – Correlation – Regression – Forecasting – Time Series Analysis. Hours: 6					

<p>Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)</p>	<p style="text-align: right;">Total Hours:30</p> <p>Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved</p> <p>(To be discussed during the Tutorial Hour)</p>
<p>Skills acquired from this course</p>	<p>Knowledge, Problem Solving, Analytical Ability, Professional Competency, Professional Communication and Transferrable Skill</p>
<p>Recommended Text</p>	<ol style="list-style-type: none"> 1. ,"Beginner's Guide for Data Analysis using R Programming",Jeeva Jose (2018) Khanna Book Publishing Co. Ltd., New Delhi. Chapters: 1,2,3,4,5, 7,11 2. Statistics Using R – Sudha G.Purohit , Sharad D.Gore, Shailaja R.Deshmukh – Narosa Publishing House
<p>Reference Books</p>	<ol style="list-style-type: none"> 1. Modern Statistics with R - Måns Thulin – FREE ONLINE BOOK 2. Introductory Statistics with R, P. Dalgaard. 2nd Edition.Springer 2008. 3. Beginning R: The Statistical Programming Language, Gardener, M (2012) Wiley Publications.
<p>Website and e-Learning source</p>	<ol style="list-style-type: none"> 1.https://cran.r-project.org/doc/manuals/r-release/R-intro.pdf 2. http://r4ds.had.co.nz

Title of the Course		E-COMMERCE AND TALLY					
Paper Number		SKILL ENHANCEMENT COURSE V					
Category	SEC	Year	II	Credits	2	Course Code	
		Semester	III				
Instructional Hours per week		Lecture		Tutorial		Lab Practice	Total
		2		--		--	2
Pre-requisite		12 th Standard Mathematics					
Objectives of the Course		<ul style="list-style-type: none"> • To acquire the basic concept of E- Business and related information technology • To recall the accounting computations • To understand the GST in Tally Essentials • To identify the accounting treatments in tally prime essentials • To explore the reports in tally 					
Course Outline		Unit I: Introduction to E-Commerce - Defining E – Commerce –features of E –Commerce - Benefits of E - Commerce - Components of E-Commerce - Functions of Electronic Commerce - Process of E-Commerce - Types of E- Commerce; Hours: 6					
		Unit II: Getting started with Tally - Meaning of Tally software – features - Advantages - Preparation for installation of tally software - installation. Items on Tally screen: Menu options, creating a New Company, Basic Currency information, other information, Company features and Inventory features. Hours: 6					
		Unit III: Accounting in Tally Prime Essentials Working with Tally Prime Essentials: Groups, Ledgers, writing voucher, different types of voucher, voucher entry Problem on Voucher entry -Trail Balance, Accounts books, Cash Book, Bank Books, Ledger Accounts, Group Summary, Sales Register and Purchase Register, Journal Register, Statement of Accounts, & Balance Sheet Hours: 6					
		Unit IV: Reports in Tally - Generating Basic Reports in Tally – Financial Statements – Accounting Books and registers - Inventory Books and Registers –Exception reports – printing reports – Types of Printing Configuration of Options – Printing Format . Hours: 6					
		Unit V: Taxes in TALLY Prime Essentials - TDS – TDS Reports – GST on Tally. Hours: 6					

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	<p style="text-align: right;">Total Hours: 30</p> <p>Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved</p> <p>(To be discussed during the Tutorial Hour)</p>
Skills acquired from this course	<p>Knowledge, Problem Solving, Analytical Ability, Professional Competency, Professional Communication and Transferrable Skill</p>
Recommended Text	<ol style="list-style-type: none"> 1. E-Commerce – Dr.V.Vidya, Dr.U.Umesh& others – Redshine Publications Pvt Ltd. [Unit -1] 2. TALLY ERP9 TRAINING GUIDE ,Asok K.Nadhani- -4th Edition, BPS Publications [Unit 2 -5]
Reference Books	<ol style="list-style-type: none"> 1. Official Guide To Financial Accounting Using Tally ERP 9 With GST by Tally education Pvt. Ltd 2. “E-Commerce: The Cutting Edge & Business”,Kamalesh K. Bajaj, Tata McGraw-Hill, 2003
Website and e-Learning source	<p>https://tallytraining.in/Tally-ERP9-Course-Syllabus-GST.pdf</p> <p>https://sscstudy.com/tally-erp-9-book-pdf-free-download/</p> <p>https://www.sarkarirush.com/tally-erp-9-book-pdf-download/</p>

Title of the Course	Industrial Mathematics - Resource Management Techniques						
Paper Number	VII						
Category	Core	Year	II	Credits	5	Course Code	
		Semester	IV				
Pre-Requisite	An introduction to Operation Research						
Objectives	<ul style="list-style-type: none"> ➤ To learn about basic ideas of Operations Research. ➤ To teach the concept of basic operation research. 			Lect. Hrs	COs	Cognitive level	
Course Outline	UNIT-I: Linear programming: Formulation – graphical solution. Simplex method. Big – M method. RTB(1): Chapter 1: Sections: 1.1 – 1.8, Chapter 2: Sections: 2.1 – 2.4, Chapter 3: Sections: 3.1 – 3.41			15	CO-1 CO-3 CO-5	K1 K3 K5 K6	
	UNIT-II: Transportation Problem: Mathematical Formulation. Basic Feasible solution. North West Corner rule – Least Cost Method – Vogel’s approximation – Optimal Solution – Unbalanced Transportation Problems – Degeneracy in Transportation problems. Assignment Problem: Mathematical Formulation. Comparison with Transportation Model. Hungarian Method. Unbalanced Assignment Problems. Sequencing Problem: n jobs on 2 machines – n jobs on 3 machines – two jobs on m machines – n jobs on m machines. RTB(1): Chapter 7: Sections: 7.1 – 7.5, Chapter 8: Sections: 8.1 – 8.9 Chapter 14: Sections: 14.1 – 14.6			15	CO-2 CO-3 CO-4	K1 K3 K5 K6	
	UNIT-III: Simulation: Monte Carlo Method – Definition, Types, Advantages and Disadvantages and Limitations, Phases. Generation of Random Numbers – Mid –Square method. Monte Carlo method of Simulation and Applications. RTB(1): Chapter 17: Sections: 17.1 - 17.7			15	CO-3 CO-4 CO-5	K1 K3 K5 K6	
	UNIT-IV: The Acceptance Sampling Problem – Advantages and Disadvantages of Sampling – Types of Sampling Plans – Lot Formation – Random Sampling – Guidelines for using Acceptance Sampling. RTB(2): Chapter 14: Section: 14.1			15	CO-2 CO-3 CO-4 CO-5	K1 K3 K5	
	UNIT-V: Acceptance Sampling by attributes: Single Sampling Plan for attributes – Definition of a single sampling plan – The OC Curve – Designing a single sampling plan with a specified OC curve – Rectifying inspection. RTB(2): Chapter 14: Section: 14.2			15	CO-2 CO-3 CO-4 CO-5	K1 K3 K5	
Total				75			

	S.No	Title of the Books	Authors	Publishers	Reprint Year
Recommended Text Books (RTB)	1	Resource Management Techniques (Operations Research)	V.Sundaresan K.S.Ganapathy Subramanian K. Ganesan	A R Publications	2001
	2	Introduction to Statistical Quality Control	Montgomery,D.C	7 th Editon, John Wiley & Sons, NewYork	1991
Reference Books (RB)	1	Operations Research	Dr. R.K.Gupta	Krishna Prakashan Media (P) Ltd.	2016
	2	Element of Probability and Statistics	Baisnab. A Jas .M	Tata McGraw Hill, Education Pvt.Ltd,New Delhi.	1993
	3	Operations Research	S.D.Sharma	Kedar Nath Ram Nath & Co Publishers	1999
	4	Operations Research Theory and Applications	J K Sharma	Trinity Press	2017
	5	Fundamental of Mathematical Statistics	V K Kapoor S.C Gupta	Sultan Chand & Sons	
	6	Operations Research	S Kalavathy	Vikas Publishing House PVT. Ltd	2015
	7	Introduction to Operations Research	Prem kumar Gupta Dr.D.S. Hira Aarti kamboj	S.Chand & Company Ltd..	2012

Title of the Course	Elements of Mathematical Analysis					
Paper Number	VIII					
Category	Core	Year	II	Credits	5	Course Code
		Semester	IV			
Pre-Requisite	Basic knowledge about Real number system and Functions.					
Objectives	<ul style="list-style-type: none"> ➤ Identify and characterize sets and functions and Understand, test and analyze the convergence and divergence of sequences, series. ➤ Understand metric spaces with suitable examples. 			Lect. Hrs	COs	Cognitive level
Course Outline	Unit I: Sets and Functions: Sets and Elements – Operations on Sets – Functions – Real Valued Functions – Equivalence – Countability –Real Numbers – least Upper Bounds. RTB(1): Chapter 1: Sections: 1.1 – 1.7.			15	CO-1	K1 K2 K5 K6
	Unit II: Sequences of Real Numbers: Definition of a Sequence and Sub sequence –Limit of a Sequence – Convergent Sequence – Divergent Sequences – Bounded Sequences – Monotone Sequences. RTB(1): Chapter 2: Sections: 2.1 – 2.6			15	CO-2 CO-3	K1 K2 K5 K6
	Unit III: Operations on Convergent Sequences – Operations on Divergent Sequences – Limit Superior and Limit Inferior – Cauchy Sequences. RTB(1): Chapter 2: Sections: 2.7 – 2.10.			15	CO-3	K1 K2 K5 K6
	Unit IV: Series of Real Numbers: Convergence – Divergence – Series With Non - Negative Terms – Alternating Series – Conditional Convergence and Absolute Convergence –Tests for Absolute Convergence. RTB(1): Chapter 3: Sections: 3.1 – 3.4 and 3.6.			15	CO-4 CO-5	K1 K2 K5 K6
	Unit V: Limits and Metric Spaces: Limit of a Function on a Real Line – Metric Spaces –Limits in Metric Spaces – Continuous Functions on Metric Spaces – Function Continuous at a Point on the Real Line – Function Continuous on a Metric Space. RTB(1): Chapter 4: Sections: 4.1 – 4.3, Chapter 5: Sections: 5.1 & 5.3			15	CO-5	K1 K2 K5 K6
Total				75		

	S.No	Title of the Books	Authors	Publishers	Reprint Year
Recommended Text Books (RTB)	1	Methods of Real Analysis	R.Goldberg	Oxford & IBH Publishing CO. PVT. LTD	2017
	1	Real Analysis	S.G.Venkatachalapathy	Margham Publications, Chennai	2012
Reference Books (RB)	2	Elements of Real Analysis	Shanthi Narayan Dr.M.D.Raisinghania	S Chand and Company Limited, New Delhi	2018
	3	Principles of Real Analysis	S. C. Malik	New Age International (P) Limited, Publisher (3 rd Edition)	2011
	4	Real Analysis	M. L. Khanna L. S. Varshney	Jai PrakashNath and Co(6 th Edition)	2011
	5	Calculus	T. M. Apostol	John Wiley & Sons(Asia)P,L td.	2002
	6	Introduction to Real Analysis	Sanjay Arora BansiLal	SatyaPrakashan, New Delhi	1991
	7	Principles of Real Analysis	A. L. Gupta N. R. Gupta	Pearson Education, (Indian print)	2003

Title of the Course	Transform Techniques						
Paper Number	IV						
Category	Elective	Year	II	Credits	3	Course Code	
		Semester	IV				
Pre-Requisite	12th Standard Mathematics						
Objectives	<ul style="list-style-type: none"> ➤ The basic knowledge about Laplace Transforms and its inverse ➤ Apply Laplace Transform in solving ODE. ➤ To solve problems in Fourier Series and Fourier Transforms. ➤ To learn the base knowledge of CSIR/SET/PGTRB 				Lect. Hrs	COs	Cognitive level
Course Outline	UNIT-I Laplace Transforms: Definition – Sufficient Condition for the Existence of Laplace Transforms (Without Proof) – Laplace Transform of Periodic Functions – Some General Theorems – Evaluation of Integrals Using Laplace Transform – Problems. RTB(1): Chapter 5: Sections: 1 – 5				12	CO-1	K1 K2 K3 K5
	UNIT-II The Inverse Laplace Transforms: Application of Laplace Transforms to Ordinary Differential Equations with Constant Coefficients and Variable Coefficients – Simultaneous Equations – Equations Involving Integrals – Problems. RTB(1): Chapter 5: Sections: 6 – 12				12	CO-1 CO-2	K1 K2 K3 K5
	UNIT-III Fourier Series: Fourier Series – Expansion of Periodic Functions of Period 2 – Expansion of Odd and Even Functions – Half Range Fourier Series – Change of Intervals – Problems RTB(1): Chapter 6: Sections: 1 – 6				12	CO-2	K1 K2 K3 K5
	UNIT-IV Fourier Transforms: Fourier Transform – Infinite Fourier Transform (Complex Form) – Properties of Fourier Transforms. RTB(1): Chapter 6: Sections: 9 – 10				12	CO-3	K1 K2 K3 K5
	UNIT-V Fourier Transforms (Continued): Fourier Cosine and Sine Transform – Properties – Convolution Theorem - Parseval's Identity – Problems. RTB(1): Chapter 6: Sections: 11 – 15				12	CO-4 CO-5	K1 K2 K3 K5
	Total				60		

Recommended Text Books (RTB)	S.No	Title of the Books	Authors	Publishers	Reprint Year
	1	Calculus Volume III	S. Narayanan T.K.Manickavachagom Pillay	Viswanathan Publishers Pvt.,Ltd.,	2012
Reference Books (RB)	1	Engineering Mathematics Volume III	P.Kandasamy and Others	S. Chand & Co	2012
	2	Advanced Engineering Mathematics	Erwin kreyszig	A Wiley Publication	2001
	3	Engineering Mathematics Volume III	A.Singaravelu	Meenakshi Agency, Chennai	2008
	4	Theory and Problems of Laplace Transforms	Murray R. Spiegel	McGraw Hill Book Company	1965

Title of the Course		INTRODUCTION TO DATA SCIENCE					
Paper Number		SKILL ENHANCEMENT COURSE - VI					
Category	SEC	Year	II	Credits	2	Course Code	
		Semester	IV				
Instructional Hours per week		Lecture		Tutorial		Lab Practice	Total
		2		--		--	2
Pre-requisite		12 th Standard Mathematics					
Objectives of the Course		<ul style="list-style-type: none"> • Understand the importance of data science in modern world • Build models for prediction and classification • Implement supervised and unsupervised machine learning algorithms • Understand the Hadoop framework 					
Course Outline		Unit I: Data Science in a Big Data World: Benefits and Uses – Facets of Data, Data Science Process – Big Data Ecosystem and Data Science Hours: 6					
		Unit II: The Data Science Process: Overview – Research Goals – Retrieving Data – Transformation – Exploratory Data Analysis – Model Building. Hours: 6					
		Unit III: Algorithms: Applications of Machine Learning in Data Science- Machine Learning Algorithms – Modelling Process – Types – Supervised – Unsupervised Hours: 6					
		Unit IV: Introduction to Hadoop: Hadoop Framework – Spark – Replacing MapReduce Hours: 6					
		Unit V: Introduction to NoSQL: NoSQL – ACID – CAP – BASE – Types Hours: 6					

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	<p style="text-align: right;">Total Hours:30</p> <p>Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved</p> <p>(To be discussed during the Tutorial Hour)</p>
Skills acquired from this course	<p>Knowledge, Problem Solving, Analytical Ability, Professional Competency, Professional Communication and Transferrable Skill</p>
Recommended Text	<p>Davey Cielen, Arno D.B. Meysman, Mohamed Ali, “Introduction to Data Science”, Manning Publications 2016 (Chapters – 1,2,3,5,6)</p>
Reference Books	<ol style="list-style-type: none"> 1. Introduction to Data Science – B. Uma Maheswari, R. Sujatha, Willey, 2021 2. “Getting Started with Data Science – Making Sense of Data with Analytics”, Murtaza Haider, IBM Press, E-book
Website and e-Learning source	<ol style="list-style-type: none"> 1. Python Data Science Handbook: Essential Tools for Working with Data by Jake Vanderplas (https://jakevdp.github.io/PythonDataScienceHandbook/) 2. An introduction to Machine Learning by Alpaydin (https://www.cmpe.boun.edu.tr/~ethem/i2ml2e/)

Title of the Course		WEB DESIGNING					
Paper Number		SKILL ENHANCEMENT COURSE - VI					
Category	SEC	Year	II	Credits	2	Course Code	
		Semester	IV				
Instructional Hours per week		Lecture		Tutorial		Lab Practice	Total
		2		--		--	2
Pre-requisite		12 th Standard Mathematics					
Objectives of the Course		<ul style="list-style-type: none"> • Understand the fundamentals of web design and electronic publishing • Learn how to create lists and nested lists using HTML • Learn how to create web page layouts and designs using CSS • Learn how to work with block elements, objects, lists, and tables using CSS • Understand the usage of themes, div, span, tables, and frames in web design 					
Course Outline		Unit I: Electronic publishing - lists and their types - nested lists - table handling- Working with Hyperlinks, Images and Multimedia- Frames: Frameset definition – frame definition – nested framesets Hours: 6					
		Unit II: Pseudo-elements – defining Styles – elements of styles –linking a style sheet to a HTML document – inline styles – External style sheets – internal Style sheets – Multiple Styles – Web page Designing. Hours:6					
		Unit III: Concept of CSS -Creating Style Sheet - CSS Properties - CSS Styling(Background-Text Format-Controlling Fonts) - Working with block elements and objects –Working with Lists and Tables. Hours:6					
		Unit IV: CSS Advanced (Grouping, Dimension, Display, Positioning, Floating, Align, Pseudo class, Navigation Bar, Image Sprites, Attribute sector) -CSS Color -Creating page Layout and Site Designs. Hours:6					
		Unit V: Forms and form elements- Creating the Web Site -Saving the site -Working on the web site -Creating web site structure -Creating Titles for web pages -Themes—Div-SPAN-table-frames. Hours:6					

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	<p style="text-align: right;">Total Hours: 30</p> <p>Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved</p> <p>(To be discussed during the Tutorial Hour)</p>
Skills acquired from this course	<p>Knowledge, Problem Solving, Analytical Ability, Professional Competency, Professional Communication and Transferrable Skill</p>
Recommended Text	<p>Internet and web technologies, by Raj kamal - Tata Mcgraw Hill (2007)</p>
Reference Books	<ol style="list-style-type: none"> 1. Web designing, Hirdesh Bharadwaj, Paper Back, 2016 2. Principles of web design, Brain D Miller, Allworth Publications, 2022
Website and e-Learning source	<p>https://www.freecodecamp.org/</p> <p>https://www.smashingmagazine.com/category/web-design/:</p>

Title of the Course		DATA ANALYSIS USING SPSS					
Paper Number		SKILL ENHANCEMENT COURSE - VII					
Category	SEC	Year	II	Credits	2	Course Code	
		Semester	IV				
Instructional Hours per week		Lecture	Tutorial	Lab Practice	Total		
		2	--	--	2		
Pre-requisite		12 th Standard Mathematics					
Objectives of the Course		<ul style="list-style-type: none"> • Train the students to gain knowledge in the statistical software (SPSS) packages for problem solving. • Introduce the basic functions of SPSS. • Train the students for making graphs and diagrams. • Provide the students with the skills to use SPSS for processing and analyzing statistical data sets. • Train the students to process data and generate outputs. 					
Course Outline		Unit I: SPSS: SPSS Data file – opening a Data file, variable view – Data view – saving the data file – Statistical Analysis – Importing Excel Files.					
		RTB(1): Chapter 2: Page no: 22-38 Hours: 6					
		Unit II: Charts and Graphs: Bar charts -Pie Chart – Scatter plots and dot plots – Line graphs – Histogram.					
		RTB(1): Chapter 4: Page No: 56-74 Hours: 6					
		Unit III: Descriptive Statistics with SPSS and t – test: Measure of Central Tendency – Measure of Dispersion – Skewness - Kurtosis – Nominal and ordinal data - One Sample t–test, independent samples t-test and Paired t-test.					
		RTB(1): Chapter 3: Page No: 39-55 Chapter 5: Page No: 75-91 Hours: 6					
		Unit IV: Analysis of Variance & Correlation Using SPSS: One-way ANOVA – Two Way ANOVA – Correlation – Spearman’s Rank Correlation.					
		RTB(1): Chapter 6: Page No: 104-118 Chapter 7: Page No: 126-136 Hours: 6					
		Unit V: Regression & Chi Square Test Using SPSS: Linear Regression – Multiple Regression - Chi-square test.					
		RTB(1): Chapter 8: Page No: 142-155 Chapter 9: Page No: 156-177 Hours: 6					

<p>Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)</p>	<p style="text-align: right;">Total Hours: 30</p> <p>Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved</p> <p>(To be discussed during the Tutorial Hour)</p>
<p>Skills acquired from this course</p>	<p>Knowledge, Problem Solving, Analytical Ability, Professional Competency, Professional Communication and Transferrable Skill</p>
<p>Recommended Text</p>	<p>1. SPSS FOR YOU – A.Rajathi, P.Chandran – MJP Publishers</p> <p>2. Statistical Methods for Practice and Research: A Guide to Data Analysis Using SPSS By: Ajai S. Gaur & Sanjaya S. Gaur - SAGE Publications India Pvt Ltd.</p>
<p>Reference Books</p>	<p>1. “SPSS in Simple Steps”, Smruti Bulsari, Sanjay Sinha Kiran Pandya, Dreamtech Press, 2011..</p> <p>2. “Statistical Data Analysis: A Practical Guide”, Milan Meloun, Woodhead Publishing India; 1 edition, 2011.</p> <p>3. A Handbook Of Statistical Analyses Using SPSS (Dr. Brijesh Awasthi) – Redshine Publication.</p>
<p>Website and e-Learning source</p>	<p>https://med.und.edu/daccota/_files/pdfs/berdc_resource_pdfs/data_analysis_using_spss.pdf</p> <p>https://students.shu.ac.uk/lits/it/documents/pdf/analysing_data_using_spss.pdf</p> <p>https://www.lboro.ac.uk/media/media/schoolanddepartments/mlsc/downloads/spss-and-statistics-guide.pdf</p>

Title of the Course		INTRODUCTION TO ARTIFICIAL INTELLIGENCE					
Paper Number		SKILL ENHANCEMENT COURSE - VII					
Category	SEC	Year	II	Credits	2	Course Code	
		Semester	IV				
Instructional Hours per week		Lecture	Tutorial	Lab Practice	Total		
		2	--	--	2		
Pre-requisite		12 th Standard Mathematics					
Objectives of the Course		<ul style="list-style-type: none"> To learn various concepts of AI Techniques. To learn various Search Algorithm in AI. To learn representation and reasoning in AI. To learn various type of Reinforcement learning. 					
Course Outline		Unit I: Introduction to AI: Scope of AI: Games, theorem proving, natural language processing, vision and speech processing, robotics, expert systems, AI techniques- Characteristics of AI problems – Intelligent Agent Hours: 6					
		Unit II: AI Approaches: Problem Solving (Blind): State space search: production systems-searching techniques -Uninformed search techniques. Hours: 6					
		Unit III: Informed /Heuristic Based Search: Generate-and-Test Algorithm - Hill Climbing - Best-First Search/Greedy Search - Branch and Bound Search - A*Algorithm - Problem Reductiion- AO* Algorithm – Constraint Satisfaction - Means-End Analysis (MEA) Hours:6					
		Unit IV: Knowledge Representation: Predicate logic: unification, modus ponens, modus tolens, resolution in predicate logic, conflict resolution, forward chaining, backward chaining, declarative and procedural representation, rule-based systems. Hours: 6					
		Unit V: Structural knowledge representation: semantic nets: slots, exceptions and default frames, conceptual dependency, scripts Hours: 6					
Extended Professional Component(is a part of internal component only, Not to be included in the External Examination question paper)		<p style="text-align: right;">Total Hours:30</p> <p>Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved (To be discussed during the Tutorial Hour)</p>					

Skills acquired from this course	Knowledge, Problem Solving, Analytical Ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	Artificial Intelligence – A Practical Approach - Rajiv Chopra – Second edition – S.Chand& Co Pvt Ltd CHAPTERS – 1,2 and 4
Reference Books	<ol style="list-style-type: none"> 1. “A Classical Approach to Artificial Intelligence”, Trivedi, M.C., Khanna Publishing House, Delhi. 2. “Artificial Intelligence”, Saroj Kaushik, Cengage Learning India, 2011. 3. Artificial Intelligence – Mishra R.B – PHI Learning Pvt Ltd
Website and e-Learning source	https://online-learning.harvard.edu/course/cs50s-introduction-artificial-intelligence-python https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-0002-introduction-to-computational-thinking-and-data-science-fall-2016/ https://online-learning.harvard.edu/course/cs50s-introduction-artificial-intelligence-python

Title of the Course	Abstract Algebra						
Paper Number	IX						
Category	Core	Year	III	Credits	4	Course Code	
		Semester	V				
Title of the Course	Basic knowledge of Sets and Functions						
Objectives	<ul style="list-style-type: none"> ➤ Concepts of Sets, Groups and Rings. ➤ Construction, characteristics and applications of the abstract algebraic structures. ➤ To learn the base knowledge of CSIR/SET/PGTRB 				Lect. Hrs	COs	Cognitive level
Course Outline	UNIT-I: Introduction to groups – Subgroups - cyclic groups - Lagrange’s Theorem - A counting principle –Examples. RTB(1): Chapter 2 : Sections: 2.4 and 2.5.				15	CO-1 CO-3	K1 K2 K5
	UNIT-II: Normal subgroups and Quotient group - Homomorphism - Automorphism - Examples. RTB(1): Chapter 2: Sections: 2.6 – 2.8				15	CO-2 CO-4	K1 K2 K5
	UNIT-III: Cayley’s Theorem - Permutation groups – Examples. RTB(1): Chapter 2: Sections: 2.9 and 2.10.				15	CO-1 CO-3	K1 K2 K3 K5
	UNIT-IV: Definition and examples of ring - Some special classes of rings- homomorphism of rings - Ideals and quotient rings - More ideals and quotient rings. RTB(1): Chapter 3: Sections: 3.1 – 3.5				15	CO-2 CO-4	K1 K2 K5
	UNIT-V: The field of quotients of an integral domain-Euclidean Rings The particular Euclidean Ring – Examples. RTB(1): Chapter 3: Sections: 3.6 – 3.8				15	CO-2 CO-4 CO-5	K1 K2 K5
Total					75		

Recommended Text Books (RBT)	S.No	Title of the Books	Authors	Publishers	Reprint Year
	1	Topics in Algebra	I.N.Herstein	Wiley Eastern Ltd.,	2016
Reference Books (RB)	1	A first course in Algebra (Seventh Edition)	John B. Fraleigh	Pearson India Education Services Pvt Limited	2016
	2	Modern Algebra	S.Arumugam	Scitech Publications (India) Pvt. Ltd.	2012
	3	University Algebra	N S Gopalakrishnan	New Age International (P) Limited	2016
	4	Modern Algebra	T. G Venkatachalapathy	Margham Publications	2011
	5	Abstract Algebra	M. Artin	2 nd Edition, Pearson	2011
	6	Contemporary Abstract Algebra (Fourth Edition)	Joseph A.Gallian	Narosa Publishers	2008
	7	An Introduction to Abstract Algebra	Anuradha Gupta Neha Bhatia	Sultan Chand and Sons	2021

Title of the Course	Real Analysis						
Paper Number	X						
Category	Core	Year	III	Credits	4	Course Code	
		Semester	V				
Pre-Requisite	Basic knowledge about Real number system and Functions						
Objectives	<ul style="list-style-type: none"> ➤ Real Numbers and properties of Real – valued functions. ➤ Connectedness, Compactness, Completeness of Metric spaces. ➤ Convergence of sequences of functions, Examples and counter examples ➤ To learn the base knowledge of CSIR/SET/PGTRB 				Lect. Hrs	COs	Cognitive level
Course Outline	UNIT-I Continuous Functions on Metric Spaces, Open Sets – Closed Sets – Discontinuous Functions on \mathbb{R}^1 – Connectedness, Completeness and Compactness – More About Open Sets – Connected Sets. RTB(1): Chapter 5: Sections: 5.4 – 5.6, Chapter 6: Sections: 6.1, 6.2				15	CO-1	K1 K2 K5 K6
	UNIT-II Bounded Sets and Totally Bounded Sets, Complete Metric Spaces – Compact Metric Spaces – Continuous Functions on a Compact Metric Space – Continuity of the Inverse Functions – Uniform Continuity. RTB(1): Chapter 6: Sections: 6.3 – 6.8				16	CO-2 CO-3	K1 K2 K5 K6
	UNIT-III Calculus: Sets of Measure Zero – Definition of Riemann Integral – Existence of Riemann Integral – Properties of Riemann Integral RTB(1): Chapter 7: Sections: 7.1 – 7.4				14	CO-3	K1 K2 K5 K6
	UNIT-IV Derivatives: Rolle’s Theorem – The Law of Mean – Fundamental Theorems of Calculus. RTB(1): Chapter 7: Sections 7.5 – 7.8				15	CO-4 CO-5	K1 K2 K5 K6
	UNIT-V Taylor’s Theorem – Pointwise Convergence of Sequence of Functions – Uniform Convergence of Sequence of Functions. RTB(1): Chapter 8: Section: 8.5, Chapter 9: Sections: 9.1 and 9.2				15	CO-5	K1 K2 K5 K6
	Total				75		

	S.No	Title of the Books	Authors	Publishers	Reprint Year
Recommended Text Books (RTB)	1	Methods of Real Analysis	R.Goldberg	Oxford & IBH Publishing CO. PVT. LTD.	2020
	1	Real Analysis	S.G.Venkatachalapathy	Margham Publications, Chennai	2012
Reference Books (RB)	2	Elements of Real Analysis	Shanthi Narayan Dr.M.D.Raisinghania	S Chand and Company Limited, New Delhi	2018
	3	Principles of Real Analysis	S. C. Malik	New Age International (P) Limited, Publisher (3 rd Edition)	2011
	4	Principles of Mathematical Analysis	Walter Rudin	Tata McGraw Hill Education, 3 rd Edition	2017
	5	Real Analysis	H. L Royden	Prentice Hall of India, New Delhi	2007
	6	Introduction to Real Analysis	Sanjay Arora BansiLal	SatyaPrakashan, New Delhi	1991
	7	Principles of Real Analysis	A. L. Gupta N. R. Gupta	Pearson Education, (Indian print)	2003

Title of the Course	Optimization Techniques						
Paper Number	V						
Category	Elective	Year	III	Credits	4	Course Code	
		Semester	V				
Pre-Requisite	An introduction to Operation Research						
Objectives	<ul style="list-style-type: none"> ➤ To learn about basic ideas of Operations Research. ➤ To teach the concept of basic operation research. ➤ To enlighten the students in the field of Operations Research this has many applications in management techniques. ➤ After the completion of the course the student will be able to Solving problem on linear programming. 				Lect. Hrs	COs	Cognitive level
Course Outline	UNIT-I Games And Strategies – Two – Person Zero Sum Game – Some Basic Terms – The Maximin-Minimax Principle – Games Without Saddle Points – Mixed Strategies – Graphical Solution Of 2xn And mx2 Games – Arithmetic Method For nxn Games. RTB(1): Chapter 17: Sections: 17.1 – 17.8				15	CO-1 CO-3 CO-5	K1 K3 K5 K6
	UNIT-II Inventory Control -Types of inventories – reasons for carrying inventories – the inventory decisions – objectives of scientific inventory control – costs associated with inventories – factors affecting inventory control – an inventory control problem – the concept of EOQ – Deterministic inventory problem with no shortages– Deterministic inventory problem with shortages – One period problem without setup cost. RTB(1): Chapter 19: Sections: 19.1 – 19.11 Chapter 20: Section: 20.5				15	CO-2 CO-3 CO-4	K1 K3 K5 K6
	UNIT-III Queueing Theory – Queueing system – Elements of queueing system – operating characteristics of queueing system – deterministic queueing system – probability distributions in queueing systems – classification of queueing models – definition of transient and steady states – models M/M/1:□/FIFO and M/M/1: N/FIFO. RTB(1): Chapter 21: Sections: 21.1 – 21.9				15	CO-3 CO-4 CO-5	K1 K3 K5 K6
	UNIT-IV Network Scheduling (PERT / CPM) – Network – Basic components – logical sequencing – rules of network construction – concurrent activities –				15	CO-2 CO-3 CO-4 CO-5	K1 K3 K5

	critical path analysis probability considerations in PERT – distinction between PERT and CPM. RTB(1): Chapter 25: Sections: 25.1 – 25.8			
	UNIT-V Information Theory: Communication Process – A Measure of Information – Entropy – The expected information – Entropy as measure of uncertainty – some properties of Entropy function, The communication system – channel probabilities – joint conditional Entropies mutual information – Encoding. RTB(1): Chapter 30: Sections: 30.1 – 30.10	15	CO-2 CO-3 CO-4 CO-5	K1 K3 K5
	Total	75		

Recommended Text Books (RTB)	S.No	Title of the Books	Authors	Publishers	Reprint Year
	1	Operations Research	Kanti Swarup P.K. Gupta Man Mohan	Sultan Chand & Sons	2008
Reference Books (RB)	1	Operations Research	Dr. R.K.Gupta	Krishna Prakashan Media (P) Ltd.	2016
	2	Operations Research	S.D.Sharma	Kedar Nath Ram Nath & Co Publishers	1999
	3	Resource Management Techniques (Operations Research)	V.Sundaresan K.S.Ganapathy Subramanian K. Ganesan	A R Publications	2001
	4	Operations Research Theory and Applications	J K Sharma	Trinity Press	2017
	5	Operations Research Problems & Solutions	V K Kapoor	Sultan Chand & Sons	2007
	6	Operations Research	S Kalavathy	Vikas Publishing House PVT. Ltd	2015
	7	Introduction to Operations Research	Prem kumar Gupta Dr.D.S. Hira Aarti kamboj	S.Chand & Company Ltd..	2012

Title of the Course		PROGRAMMING IN C AND PRACTICALS					
Paper Number		ELECTIVE COURSE V					
Category	Elective	Year	III	Credits	3	Course Code	
		Semester	V				
Instructional Hours per week		Lecture	Tutorial	Lab Practice	Total		
		4	--	1	5		
Pre-requisite		12 th Standard Mathematics					
Objectives of the Course		<ul style="list-style-type: none"> • About the basic concepts and structure of C Program • To write simple programs with Mathematical Applications 					
Course Outline		Unit I: Introduction: Importance of C – Programming Style Character Set – C Tokens – Keywords and Identifiers – Constants – Variables – Declaration of Storage Class – Assigning Values to Variables – Defining Symbolic Constants. Hours: 15					
		Unit II: Operators and expressions – arithmetic, relational, logical, assignment, increment and decrement, bitwise, conditional, special operators – arithmetic expressions – evaluation of expressions – precedence of arithmetic expressions. Hours: 15					
		Unit III: Managing Input and Output Operations – Reading a character – writing a character – formatted input – formatted output – decision making with if – simple if, if else, nesting of if else, else if, switch, goto, while do while, for statements – jumps in loops. Hours: 15					

	<p>Unit IV: Arrays – One dimensional arrays – declaration of one dimension arrays – initialization of one dimensional arrays – two dimensional arrays – initializing two dimensional arrays – multi dimensional arrays – dynamic arrays Hours: 15</p>
	<p>Unit V: Structure definition – declaring structure variables – accessing structure members – structure initialization – pointer – expressions – pointer increment and scale factor – pointer and arrays – array of pointers – pointers as function arguments – function returning pointer – pointer to functions. Hours: 15</p>
<p>Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)</p>	<p>Total Hours: 75</p> <p>Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved (To be discussed during the Tutorial hour)</p>
<p>Skills acquired from this course</p>	<p>Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</p>
<p>Recommended Text</p>	<p>Programming in ANSI C, E. Balagurusamy, McGraw Hill Education India Pvt. Ltd.</p>
<p>Reference Books</p>	<p>1. “Programming with C, Byron Gotfried, Schaum’s outline Fourth Edition, Tata Mcraw Hill, 2018</p> <p>2. C Programming Language, Darrel L. Graham, Createspace Independent Publishing Company, 2016</p> <p>Yashvant Kanetkar, Let us C, 18th Edition, BPB Publications, 2021</p>
<p>Website and e-Learning Source</p>	<p>1. The C Book – a free online book on C Programming: https://publications.gbdirect.co.uk//c_book/</p> <p>2. C Programming Wikibook – a free online wikibook on C Programming: https://en.wikibooks.org/wiki/C_Programming</p> <p>3. https://www.learn-c.org/</p> <p>4 . https://www.geeksforgeeks.org/c-programming-language/</p> <p>5. https://www.cprogramming.com/tutorials/c-tutorial.html</p>

PROGRAMMING IN C PRACTICAL LIST
SEMESTER V

1. Create a one-dimensional array of characters and store a string inside it by reading from standard input.
2. Write a program to input 20 arbitrary numbers in one dimensional array, Calculate the frequency of each number. Print the number and its frequency in a tabular form.
3. Write a C function to remove duplicates from an ordered array
4. Write a program which will arrange the positive and negative numbers in one dimensional array in such a way that all negative numbers should come first and then all the positive numbers will come without changing the original sequence of numbers.
5. Write a program to perform the following operations on a 2D array a. Addition, b.Multiplication, c. Transpose
6. Write a program to find the GCD and LCM of two numbers
7. Implement a swap () function which exchanges the values of two integers. Call thefunction from the main to test the function with different values.
8. Write a program to remove duplicates from an ordered array
9. Write a function to generate the Fibonacci series using recursion.
10. Write a recursive function that adds first 'n' natural numbers.
11. Write a recursive function that finds factorial of a number.
12. Write a program to demonstrate the use of recursion in Tower of Hanoi Problem

Title of the Course	Discrete Mathematics							
Paper Number	VI							
Category	Elective	Year	III	Credits	3	Course Code		
		Semester	V					
Pre-Requisite	An introduction to Discrete Mathematics							
Objectives	<ul style="list-style-type: none"> ➤ To learn the fundamental concepts of discrete mathematics. ➤ To know the concept of Boolean Algebra. ➤ To know the applications of discrete mathematics in networks, computer science and graph theory in science, business and industry. 					Lect. Hrs	COs	Cognitive level
Course Outline	UNIT-I Propositional Logic: Definition, Statements & Notation, Truth Values, Connectives, Statement Formulas & Truth Tables, Well - formed Formulas, Tautologies, Equivalence of Formulas, Duality Law, Tautological Implications, Examples. RTB(1): Chapter I: Page No. 1 - 7					15	CO-1 CO-5	K1 K3 K5
	UNIT-II Predicate Logic: Definition of Predicates; Statement functions, Variables, Quantifiers, Predicate Formulas, Free & Bound Variables; The Universe of Discourse, Examples, Valid Formulas & Equivalences, Examples. RTB(1): Chapter I: Page No. 29 - 33					15	CO-2	K1 K3 K5
	UNIT-III Lattices & Boolean Algebra: Properties of lattices – Lattice as Algebraic System – Sublattices – lattice Homomorphism - Special Lattices – Boolean Algebra- sub algebra- Boolean Expression and Boolean functions - expression of a Boolean function in canonical form – logic Gates – Karnaugh Map Method. RTB(1): Chapter II: Page No. 99 – 114 (Omit 106, 110, 111)					15	CO-3 CO-5	K1 K3 K5
	UNIT-IV Basics of Counting: The Pigeonhole Principle, Permutations and Combinations, Binomial Coefficients, Generalized Permutations and Combinations, Generating Permutations and Combinations, Inclusion - Exclusion Principle. RTB(1): Chapter IV: Page No. 318 - 337					15	CO-4	K1 K3 K5
	UNIT-V Formal Language: Introduction – Phrase – Structure Grammar - Types – BNF - Finite state Machine – Input output strings – Finite state Automata. RTB(1): Chapter XIII: Page No. 448 - 463					15	CO-5	K1 K3 K5
Total						75		

Recommended Text Books (RTB)	S.No	Title of the Books	Authors	Publishers	Reprint Year
		1	Discrete Mathematics	T.Veerarajan	McGraw Hill Education
Reference Books (RB)	1	Elements of Discrete Mathematics	C. L. Liu	New year Mcgraw-Hill	1977
	2	Advanced Discrete Mathematics	G.C.Sharma	University Science Press	2009
	3	Discrete Mathematics- A Unified Approach	S. Witala	McGraw Hill Book Co.	2008
	4	Discrete Mathematics	M. K. Sen and B. C. Chakraborty	Books and Allied Private Ltd	2002
	5	Discrete Mathematical Structures with Applications to Computer Science	J.P.Tremblay R. Manohar	Tata McGraw-Hill Edition	2000
	6	Discrete Mathematics and Its Applications	Kenneth H. Rosen.	McGraw Hill Book Co.	2007
	7	Advance Discrete Mathematics	G.C.Sharma Dr. Madhu Jain	Laxmi publications	2011

Title of the Course		PROJECT WITH VIVA VOCE					
Paper Number		CORE M12					
Category	Core	Year	III	Credits	4	Course Code	
		Semester	V				
Instructional Hours per week		Lecture		Tutorial	Lab Practice	Total	
		4		--	--	4	

Title of the Course		Internship/Industrial Training					
Paper Number							
Category	SEC	Year	III	Credits	2	Course Code	
		Semester	V				

Dept. conduct a project through nearby companies to the students.

Title of the Course	Linear Algebra						
Paper Number	XIII						
Category	Core	Year	III	Credits	4	Course Code	
		Semester	VI				
Pre-Requisite	Basic Knowledge of Vector Algebra & Matrices.						
Objectives	<ul style="list-style-type: none"> ➤ Vector Spaces, linear dependence and independence of vectors. Dual spaces, Inner product and norm – orthogonalization process. ➤ Linear transformations. Various operators on vector spaces. ➤ To learn the base knowledge of CSIR/SET/PGTRB 				Lect. Hrs	COs	Cognitive level
Course Outline	UNIT-I Vector spaces-I: Elementary Basic Concepts – Linear Independence and Bases. RTB(1): Chapter 4: Sections: 4.1 – 4.2.				16	CO-1	K1 K3 K5
	UNIT-II Vector spaces-II: Dual Spaces RTB(1): Chapter 4: Section: 4.3.				14	CO-1 CO-2	K1 K3 K5
	UNIT-III Vector spaces-III: Inner Product Spaces RTB(1): Chapter 4: Section: 4.4.				14	CO-3	K1 K3 K5
	UNIT-IV Linear Transformation-I: Algebra of Linear Transformations – Characteristic roots. RTB(1): Chapter 6: Sections: 6.1, 6.2.				16	CO-1 CO-4 CO-5	K1 K3 K5
	UNIT-V Linear Transformation-II: Matrices – Elementary Matrices and Transformations and solved problems – Linear Equations and its problems – Diagonalising a Matrix – Cayley Hamilton Theorem. RTB(1): Chapter 6: Section: 6.3. RTB(2): Chapter 18: Sections: 18.31, 18.32 Chapter 19: Sections: 19.1-19.4, 19.26, 19.27.				15	CO-5	K1 K3 K5
Total					75		

Recommended Text Books (RTB)	S.No	Title of the Books	Authors	Publishers	Reprint Year
	1	Topics in Algebra	I.N.Herstein	Wiley Publications	2016
	2	Modern Algebra	S.G.Venkatachalapathy	Margham publications	2011
Reference Books (RB)	1	A first course in Algebra (Seventh Edition)	John B. Fraleigh	Pearson India Education Services Pvt Limited	2016
	2	Linear Algebra	Stephen H Friedberg Arnold J Insel Lawrence E Spence	Pearson 5 th edition	2018
	3	University Algebra	N S Gopalakrishnan	New Age International (P) Limited	2016
	4	Modern Algebra	Visvanathan Nayak	Emerald Publishers	1992
	5	Linear Algebra (Third Edition)	Seymour Lipschutz Marc Lipson	McGraw Hill Education	2017
	6	Modern Algebra	M.L.Santiago	Tata McGraw Hill, New Delhi	2002
	7	Introduction to Linear Algebra (Fifth Edition)	Lee Johnson Dean Riess Jimmy Arnold	Pearson India	2019

Title of the Course	Complex Analysis						
Paper Number	XIV						
Category	Core	Year	III	Credits	4	Course Code	
		Semester	VI				
Pre-Requisite	A study about School Level Complex Numbers.						
Objectives	<ul style="list-style-type: none"> ➤ To learn the Concepts and consequences of analyticity and C-R equations. ➤ To understand the concept of mappings and transformations 				Le ct. Hr s	COs	Cognitive level
Course Outline	UNIT-I Analytic functions: Functions of a Complex variable – Limits – Theorem on limits –Continuity – Derivatives – Differentiation formulas – Cauchy Riemann equation – Sufficient conditions for differentiability – Polar coordinates– Analytic functions– Examples- Harmonic functions. RTB(1): Chapter 2: Sections: 12 -26 (Omit Sections 13, 14 and 17)				15	CO-1	K1 K2 K3 K4
	UNIT-II Mappings - Mapping with exponential function - Linear transformation - The transformation $w = 1/z$ - mappings by $1/z$ - Linear fractional transformation (bilinear) - An implicit form. RTB(1): Chapter 2: Sections: 13, 14 Chapter 8: Sections: 90 - 94				15	CO-1 CO-4	K1 K2 K3 K5
	UNIT-III Complex Integration: Contours - Contour integrals – Some Examples – Simply and Multiply connected domains – Cauchy integral formula –Liouville’s theorem and Fundamental theorem of Algebra – Maximum modulus principle. RTB(1): Chapter 4:Sections:39- 41, 48, 49, 50, 53, 54.				15	CO-1 CO-2 CO-3	K1 K2 K3 K4
	UNIT-IV Sequences and Series: Convergence of sequences - Convergence of series - Taylor series - Examples - Laurent series - Examples - Absolute and uniform convergence of power series RTB(1): Chapter 5: Sections: 55 – 63 (Omit 58, 61)				15	CO-4	K1 K2 K3 K4
	UNIT-V Residues and Poles: Isolated singular points – Residues – Cauchy Residue theorem –The three types of isolated singular points – Residues at poles – Examples – Zeros of analytical functions – Zeros and poles – Evaluation of Improper Integrals. RTB(1): Chapter 6: Sections:68 - 76(omit Section 71) Chapter 7: Section: 78.				15	CO-1 CO-5	K1 K2 K4 K6
Total					75		

Recommended Text Books (RTB)	S.No	Title of the Books	Authors	Publishers	Reprint Year
	1	Complex variables and application	James Ward Brown Ruel V.Churchill	Mc-Graw Hill Book Co.,	2019 (Indian edition 2014)
Reference Books (RB)	1	Complex Analysis	Lars V. Ahlfors	McGraw Hill Education(In dia) Private Limited	2013
	2	Complex Analysis	S.G.Venkatachalapathy	Margham Publications	2011
	3	Complex Analysis	S.Arumugam, A.Thangapandi Isaac,A.Somasundaram	Scitech Publications (India) Pvt.Ltd	2012
	4	Complex Analysis	P.Duraipandian Laxmi Duraipandian, D.Muhilan	S.Chand publications publications	1988
	5	Complex Variables: Theory and Applications	H. S. Kasana	Prentice Hall	2005
	6	Complex Variables	M. R. Spiegel	McGraw Hill Book Company	1974
	7	Foundations of Complex Analysis	S. Ponnusamy	Narosa Publishing House	2017

Title of the Course	Mechanics						
Paper Number	XV						
Category	Core	Year Semester	III VI	Credits	4	Course Code	
Pre-Requisite	12 th Standard Mathematics						
Objectives	<ul style="list-style-type: none"> ➤ Equilibrium of a particle under the action of given forces. ➤ Simple Harmonic Motion, Projectiles. ➤ To learn the base knowledge of PGTRB/TNPSC 				Lect. Hrs	COs	Cognitive level
Course Outline	UNIT-I Force: Newton's laws of motion – Resultant of two forces on a particle. Equilibrium of a Particle: Equilibrium of a particle – Limiting equilibrium of a particle on an inclined plane. RTB(1): Chapter 2: Sections: 2.1 and 2.2, Chapter 3: Sections: 3.1 and 3.2.				15	CO-1	K1 K2 K3 K5
	UNIT-II Forces on a Rigid Body: Moment of a Force – General motion of a body – Equivalent systems of forces- Parallel Forces – Couples. A Specific reduction of Forces: Reduction of coplanar forces into a force and couple – Problems involving frictional forces. RTB(1): Chapter 4: Sections: 4.1 to 4.4, 4.6 (Omit Sections 4.5, 4.7 to 4.9) Chapter 5: Sections: 5.1, 5.2.				15	CO-2	K1 K2 K3 K5
	UNIT-III Work, Energy and Power: Work – Conservative field of force. Rectilinear Motion under Varying Force: Simple Harmonic Motion - along a horizontal line – along a vertical line. RTB(1): Chapter 11: Sections: 11.1 and 11.2. Chapter 12: Sections: 12.1 to 12.3 (Omit Section 12.4)				15	CO-1 CO-2 CO-3	K1 K2 K3 K5
	UNIT-IV Projectiles: Forces on a projectile – Projectile projected on an inclined plane. RTB(1): Chapter 13: Sections: 13.1, 13.2 (Omit Section 13.3)				15	CO-5	K1 K2 K3 K5
	UNIT-V Central Orbits: General orbits – Central orbit – Conic as a centered orbit. RTB(1): Chapter 16: Sections: 16.1 – 16.3.				15	CO-4	K1 K2 K3 K5
	Total				75		

	S.No	Title of the Books	Authors	Publishers	Reprint Year
Recommended Text Books (RTB)	1	Mechanics	P.Duraipandian Lakmi Duraipandian Muthamizh Jayapragasam	S.Chand Company LTD	2020
	1	Dynamics	A.V.Dharmapandam	S.Viswanathan (Printers & Publishers) PVT LTD	2013
Reference Books (RB)	2	Dynamics	P.R.Vittal	Margaam Publications	2009
	3	Dynamics	M.Narayanamurti	The National Publication Company	2008
	4	Mechanics	D.S.Mathur	S.Chand Company LTD	2020
	5	A textbook of Engineering Mechanics	RS.Khurmi N.Khurmi	S.Chand Company LTD	2019
	6	Dynamics	K.Viswanatha Naik M.S.Kasi	Emerald Publishers	2007
	7	Element of Mechanics	P.F.Kelly	CRC Press	2016

Title of the Course		PROGRAMMING IN C++ THEORY WITH PRACTICALS					
Paper Number		ELECTIVE COURSE VII					
Category	Elective	Year	III	Credits	3	Course Code	
		Semester	VI				
Instructional Hours per week		Lecture		Tutorial		Lab Practice	Total
		4		--		1	5
Pre-requisite		12 th Standard Mathematics					
Objectives of the Course		<ul style="list-style-type: none"> • To understand about object-oriented languages and their applications • To introduce basic concepts of C++ language • To provide knowledge about various conversions • To enlighten the various inheritance system • To impart knowledge on files and exception handling 					
Course Outline		Unit I: Introduction to C++; Tokens, Keywords, Identifiers, Variables, Operators, Manipulators, Data types -Expressions and Control Structures in C++; Simple C++ Programs. Hours: 15					
		Unit II: Functions in C++ - Main Function - Function Prototyping – Parameters Passing in Functions - Values Return by Functions – Inline Functions - Friend and Virtual Functions –Math Library functions Hours:15					
		Unit III: Classes and Objects; Constructors and Destructors; Operator Overloading and Type Conversions - Type of Constructors – Function, Definition - Function overloading – Function Overriding. Hours: 15					
		Unit IV: Inheritance: Single Inheritance - Multilevel Inheritance – Multiple Inheritance - Hierarchical Inheritance - Hybrid Inheritance - Pointers, Virtual Functions and Polymorphism; Managing Console I/O operations. Hours: 15					
		Unit V: Working with Files: Classes for File Stream Operations - Opening and Closing a File - Endof-File Deduction - File Pointers - Updating a File - Error Handling during File Operations - Command-line Arguments. Hours: 15					

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	<p style="text-align: right;">Total Hours: 75</p> <p>Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved</p> <p>(To be discussed during the Tutorial hour)</p>
Skills acquired from this course	<p>Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</p>
Recommended Text	<p>1. Object Oriented Programming with C++ by E. Balagurusamy, 1995, Tata McGraw-Hill Publishing Company Ltd</p>
Reference Books	<ol style="list-style-type: none"> 1. Robert Lafore, Galgotia publication 2. Object Oriented Programming in Microsoft C++, Byron S.Gottfried, Schaum's Outline of programming with C++ 2nd Edition 3. "Let us C++" – Yeswant Kanetkar – BPB Publications, 1999
Website and e-Learning Source	<ol style="list-style-type: none"> 1.http://cppannotations.sourceforge.net/ 2.https://www.cplusplus.com/doc/tutorial/ 3.https://www.programiz.com/cpp-programming

C++ PROGRAMMING LIST

1. Write a Program to illustrate New and Delete Keywords for dynamic memory allocation
2. Write a program Illustrating Class Declarations, Definition, and Accessing Class Members
3. Program to illustrate default constructor, parameterized constructor and copy constructors
4. Write a Program to Demonstrate the i) Operator Overloading. ii) Function Overloading
5. Write a Program to Demonstrate Friend Function and Friend Class
6. Write a Program to Access Members of a STUDENT Class Using Pointer to ObjectMembers.
7. Program to Generate Fibonacci Series use Constructor to Initialize the Data Members.
8. Write a C++ program to implement the matrix ADT using a class.
The operations supported by this ADT are: a) Reading a matrix.
b) Addition of matrices.
c) Printing a matrix. d) Subtraction of matrices. e) Multiplication of matrices
9. Write C++ programs that illustrate how the following forms of inheritance are supported: a)Single inheritance b)Multiple inheritance c)Multi level inheritance
d)Hierarchical inheritance
10. Write a C++ program that illustrates the order of execution of constructors and destructors when new class is derived from more than one base class.

Title of the Course	Graph Theory with Applications						
Paper Number	VIII						
Category	Elective	Year III	Semester VI	Credits	3	Course Code	
Pre-Requisite	An introduction to Graph Theory						
Objectives	<ul style="list-style-type: none"> ➤ To learn about the basic ideas of graph theory. ➤ To learn about the application of graph theory. ➤ To approach practically with help of graph software. ➤ To learn the base knowledge of higher studies. ➤ To learn the base knowledge of CSIR/SET/PGTRB. 				Lect. Hrs	COs	Cognitive level
Course Outline	UNIT-I Introduction to Graph Theory: Type of Graph, Degree, Subgraph, Operation on Graph.				15	CO-1	K1 K2 K5
	RTB(1): Chapter 1: Sections: 1.1 – 1.10						
	UNIT-II Introduction to Graph Theory: Ramsay Graph, Connected Graph, Euler Graph, Hamiltonian Graph, Matrix, Representation of Graphs.				15	CO-2	K1 K2 K5
	RTB(1): Chapter 1: Sections: 1.11 – 1.22						
	UNIT-III Planar Graphs: Planar Graphs and its types, Euler formula.				15	CO-3 CO-4	K1 K2 K5
	RTB(1): Chapter 2: Sections: 2.1 – 2.12						
UNIT-IV Trees: Trees and co - trees.				15	CO-4	K1 K2 K5	
RTB(1): Chapter 3: Sections: 3.1 – 3.4(3.4.1 only)							
UNIT-V Matching: Distance and Diameter, Connectivity of vertex and edges				15	CO-5	K1 K2 K5	
RTB(1): Chapter 4: Section: 4.3 (4.3.8-4.3.15 only)							
Total				75			

Recommended Text Books (RTB)	S.No	Title of the Books	Authors	Publishers	Reprint Year
	1	Graph Theory with Applications	C.Vasudev	New Age International Publishers	2006
Reference Books (RB)	1	Graph Theory	Harary	Narosa Publishing House	2001
	2	Graph Theory	S.P.Rajagopalan	Margham Publications	2009
	3	Introduction to Graph Theory	S.Arumugam Ramachandran	Scitech Publications (India) PVT. LTD	2001
	4	Graph Theory	J. A. Bondy U.S.R.Murty	Springer	2013
	5	Graph Theory with applications	J. A. Bondy and U.S.R.Murty	Elsevier Science Publishing. Co. Inc	1982
	6	Graph Theory with Application to Engineering and Computer Science	Narsingh Deo	Prentice hall of India private Limited	1997
	7	A Textbook of Graph Theory	R.Balakrishnan	Springer	2012

Title of the Course		Professional Competency Skill Mathematics for Competitive Examinations & General Studies					
Paper Number							
Category	SEC	Year	III	Credits	2	Course Code	
		Semester	VI				

Dept. conduct an objective type examination to the students related to Competitive Examinations & General Studies.

Title of the Course	Mathematics-I		
Category	Allied/Elective	Course Code	
Pre-Requisite	An introduction to basic Algebra		
Objectives	<ul style="list-style-type: none"> ➤ Basic ideas on Matrices. ➤ Knowledge to solve theoretical and applied problems. ➤ To learn about Algebraic Methods to solve a variety of problems involving exponential, logarithmic series. 		Lect. Hrs
Course Outline	UNIT-I Summation of series: Binomial series - Exponential series -Logarithmic series - Simple Problems. RTB(1): Chapter 2: Sections: 2.1, 2.3, 2.4, 2.6.		15
	UNIT-II Matrices: Symmetric – Skew-Symmetric – Hermitian – Skew - Hermitian – Orthogonal and Unitary matrices – Cayley-Hamilton theorem (without proof) – Verification- Computation of inverse of matrix using Cayley - Hamilton theorem. RTB(1): Chapter 3: Sections: 3.1, 3.6.		15
	UNIT-III Numerical Methods: Newton’s method to find a root approximately. Finite Differences: Interpolation: Operators $\Delta, \nabla, E, E^{-1}$ difference tables. Interpolation formulae: Newton’s forward and backward interpolation formulae for equal intervals, Lagrange’s interpolation formula. RTB (1): Chapter 4: Section: 4.7. Chapter 5: Sections: 5.1 and 5.2.		15
	UNIT-IV Trigonometry: Expansions of $\sin^n\theta$, $\cos^n\theta$ in a series of powers of $\sin\theta$ and $\cos\theta$ - Expansions of $\sin(n\theta)$ and $\cos(n\theta)$ in a series sines and cosines of multiples of “ θ ” - Expansions of $\sin\theta$, $\cos\theta$ and $\tan\theta$ in a series of powers of “ θ ” – Hyperbolic and inverse hyperbolic functions. RTB (1): Chapter 6: Sections: 6.1 – 6.5		15
	UNIT-V Differential Calculus: Successive differentiation, nth derivatives, Leibnitz theorem (without proof) and applications, Jacobians, maxima and minima of functions of two variables- Simple problems RTB (2): Chapter 1: Sections: 1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.2.1, 1.3.1.		15
		Total	75

	S.No	Title of the Books	Authors	Publishers	Reprint Year
Recommended Text Books (RTB)	1	Allied Mathematics Volume I	Duraipandian . P Udhayabaskaran S	S.Chand & Company Pvt. Ltd.	1999
	2	Allied Mathematics Volume II	Duraipandian . P Udhayabaskaran S	S.Chand & Company Pvt. Ltd.	2000
Reference Books (RB)	1	Algebra	Dr.S.J.Venkatesan	Sri Krishna Publications, Chennai	2019
	2	Algebra	S.Arumugam	New Gama publishing house, Palayamkottai	2010
	3	Allied Mathematics	Venkatachalapathy S.G	Margham Publications.	2016
	4	Engineering Mathematics	Dr.M.K.Venkataraman	The National Publication Company	2000
	5	Engineering Mathematics	A.J.M.Spencer	EL/BS and Van Nostrand Reinhold (U.K) Co.LTD	1983
	6	Engineering Mathematics-I	G.Balaji	G,Balaji Publishers	2013
	7	Algebra, Volume I	T. K. Manicavachagam Pillay T.Natarajan K.S.Ganapathy	Viswanathan Publication	2015

Title of the Course	Mathematics-II		
Category	Allied/Elective	Course Code	
Pre-Requisite	An introduction to basic differentiation and integration.		
Objectives	<ul style="list-style-type: none"> ➤ To study on Integral calculus and its applications ➤ To study Ordinary differential equations and partial differential equations. ➤ To learn laplace transforms and vector differentiation ➤ To learn the base knowledge of higher studies. 	Lect. Hrs	
Course Outline	UNIT-I Integral calculus: Bernouli's Formula, Reduction Formula $\sin^n x$, $\cos^n x$, $\sin^m x \cos^n x$ – Simple problems. RTB(1): Chapter 2: Sections: 2.5.5 , 2.6.2		15
	UNIT-II Fourier Series: Fourier series for functions $(0, 2\pi), (-\pi, \pi)$ RTB(1): Chapter 3: Sections: 3.1.1, 3.1.2		15
	UNIT-III Differential Equations: Ordinary Differential Equations: second order non- homogeneous differential equations with constant coefficients of the form $ay'' + by' + cy = X$ where X is of the form $e^{\alpha x} \cos \beta x$ and $e^{\alpha x} \sin \beta x$ -Related problems only. Partial Differential Equations: Formation, complete integrals and general integrals, four standard types and solving Lagrange's linear equation $Pp + Qq = R$. RTB(1): Chapter 4: Sections: 4.3.1, Chapter 5: Sections: 5.1.1, 5.4.1		13
	UNIT-IV Laplace Transforms: Laplace transformations of standard functions and simple properties, inverse Laplace transforms. RTB(1): Chapter 6: Sections: 6.1.1, 6.1.2, 6.2.1		18
	UNIT-V Vector Differentiation: Introduction, Scalar point functions, Vector point functions, vector differential operator Gradient, Divergence, Curl, Solenoidal, irrotational, identities. RTB(1): Chapter 7: Sections: 7.1.1 to 7.1.3, 7.2.1 to 7.2.5, 7.3.1 to 7.3.4		14
		Total	75

Recommended Text Books (RTB)	S.No	Title of the Books	Authors	Publishers	Reprint Year
	1	Allied Mathematics Volumes I&II	Duraipandian P. Udayabaskaran S	Margam Publications	2000
Reference Books (RB)	1	Engineering Mathematics (Volume I)	P.Kandasamy	S.Chand Company LTD	2001
	2	Concepts of Functions & Calculus	Vikas Rahi	The Tata McGraw Hill Companies	2009
	3	Theory and problems of Differential and Integral Calculus	Frank Ayres	Schaums Outline Series, McGraw Hill Companies	1992
	4	Calculus (Volume-I)	S.Narayanan T.K.Manicavachagom Pillay	S.Viswanathan (printers & Publishers) PVT LTD	2006
	5	Differential Calculus	Dr.S.J.Venkatesan	Sri Krishna Publications, Chennai	2019
	6	Allied Mathematics	Singaravelu A	Meenakshi Agency, Chennai	2016
	7	Differential Calculus	Shanthi Narayanan P.K.Mittal	S.Chand & Co,	2018

Title of the Course	Statistics - I							
Paper Number	XIII							
Category	Allied/Elective	Year	II	Credits	4	Course Code		
		Semester	III					
Pre-Requisite	12th Standard Mathematics							
Objectives	<ul style="list-style-type: none"> ➤ To understand and apply statistical tools in Business ➤ Analyzing the data and drawing conclusions from it ➤ To learn the base knowledge of CSIR/SET/PGTRB 					Lect. Hrs	COs	Cognitive level
Course Outline	UNIT-I Introduction – Importance, Functions, Limitations – Statistical Survey – Collection of data – Sampling design – Classification and Tabulation. RTB(2): Chapter 1, 2, 3.					12	CO-1	K1 K2 K5 K6
	UNIT-II Diagrammatic Representation – Bar diagram – Multiple Bar diagram – Component Bar diagram – Percentage Bar diagram – Pie diagram – Graphical representation – Histogram – Frequency polygon – Frequency curve – Ogives curve – Lorenz curve. RTB(1): Part II: Chapter 4					12	CO-2 CO-3	K1 K2 K5 K6
	UNIT-III Measures of central tendency – Mean, Median, Mode, Geometric Mean, Harmonic Mean; Measures of Dispersion – Range, Quartile Deviation – Mean Deviation – Standard Deviation, Coefficient of variation. RTB(1): Part II: Chapter 5, 6					12	CO-1 CO-3	K1 K2 K5 K6
	UNIT-IV Measure of Skewness – Types of Skewness – Karl Pearson Coefficient of Skewness, Bowley’s Coefficient of Skewness – Kurtosis and Moments. RTB(1):Part II: Chapter 7					12	CO-2 CO-4	K1 K2 K5 K6
	UNIT-V Correlation – Simple Correlation – Rank Correlation – Probable Error – Regression – Curve Fitting – Principle of least squares – Fitting of Straight line. RTB(1): Part I: Chapter 8, 9 Chapter 10: Page No: 10-10.9					12	CO-5	K1 K2 K5 K6
	Total					60		

	S.No	Title of the Books	Authors	Publishers	Reprint Year
Recommended Text Books	1	Mathematical Statistics	P. R. Vittal	Margham Publications	2010
	2	Statistics theory and Practice	R.S. N Pillai Bagavathi	S. Chand	2008
Reference Books (RB)	1	Mathematical Statistics	J N Kapur H C Saxena	S. Chand	2019
	2	Business Mathematics and Statistics	PA. Navitham	Jai Publishers	2012
	3	Elements of Mathematical Statistics	S.C. Gupta V.K. Kapoor	S.Chand &Co	2015
	4	Mathematical Statistics with Applications	Wackerly Mendenhall Scheaffer	Cengage Learning Inc	2015
	5	Statistics and Numerical Methods	G. Balaji	G. Balaji Publishers	2012
	6	Elementary Statistical Analysis	Wilks S.S	Oxford and IBH	2015

Title of the Course	Statistics - II						
Paper Number	IV						
Category	Allied/Elective	Year	II	Credits	6	Course Code	
		Semester	III				
Pre-Requisite	12th Standard Mathematics						
Objectives	<ul style="list-style-type: none"> ➤ Applications in almost every sphere of human activity. ➤ Statistics is a branch of applied mathematics which specializes in data. ➤ To learn the base knowledge of higher studies. ➤ To learn the base knowledge of CSIR/SET/PGTRB. 				Lect. Hrs	COs	Cognitive level
Course Outline	UNIT-I Probability – definitions – Addition and Multiplication Theorem – Axioms of Probability – Conditional Probability – Independent Events – Bayes Theorem. RTB(1): Part I: Chapter 1				12	CO-1	K1 K2 K5 K6
	UNIT-II Random Variables – Discrete Random Variables – Continuous Random Variables – Cumulative distribution – Properties of Distribution Function – Mathematical Expectation – Variance. RTB(1): Part I: Chapter 2: Page No: 2.1 - 2.16 Chapter 3, 4				12	CO-2 CO-3	K1 K2 K5 K6
	UNIT-III Theoretical Distributions – Binomial Distribution – Poisson distribution – Normal Distribution – Problems. RTB(1): Part I: Chapter 12: Page No: 12 - 12.16 Chapter 13: Page No: 13 - 13.12 Chapter 16: Page No: 16 - 16.27				12	CO-1 CO-3	K1 K2 K5 K6
	UNIT-IV Sampling Distribution – Test of Hypothesis – Test of significance based on large samples – Test for Mean and Proportion – Confidence Interval. RTB(1): Part I: Chapter 24: Page No: 24.1 - 24.35, 24.44 - 24.46				12	CO-2 CO-4	K1 K2 K5 K6
	UNIT-V: Small Samples – Student ‘t’ test, F-test, Chi-square test – ANOVA – one way and Two way classification. RTB(1): Part I: Chapter 25, 26, 27.				12	CO-5	K1 K2 K5 K6
					Total	60	

Recommended Text Books	S.No	Title of the Books	Authors	Publishers	Reprint Year
	1	Mathematical Statistics	P. R. Vittal	Margham Publications	2010
Reference Books (RB)	1	Mathematical Statistics	J N Kapur H C Saxena	S. Chand	2019
	2	Business Mathematics and Statistics	PA. Navitham	Jai Publishers	2012
	3	Statistics theory and Practice	R.S. N Pillai Bagavathi	S. Chand	2008
	4	Elements of Mathematical Statistics	S.C. Gupta V.K. Kapoor	S.Chand &Co	2015
	5	Mathematical Statistics with Applications	Wackerly Mendenhall Scheaffer	Cengage Learning Inc	2015
	6	Statistics and Numerical Methods	G. Balaji	G. Balaji Publishers	2012
	7	Elementary Statistical Analysis	Wilks S.S	Oxford and IBH	2015

STATISTICS -I & II – (PRACTICALS)

LIST OF PRACTICALS

SEMESTERS III & IV

UNIT I

Frequency distribution – Univariate & Bivariate frequency table.

UNIT II

Measure of Central tendency and Measure of Dispersion.

UNIT III

Correlation - Rank Correlation – Regression – Fitting of straight line.

UNIT IV

Large Sample Tests – Test for Mean & proportion

Small Sample Tests – t, F, Chi-square test.

UNIT V

ANOVA – One way and two-way classification.

Algebra and Trigonometry (Subject Code) Course Outcome

CO-1 Gain knowledge about the introduction of partial fractions & About the expansion of trigonometric functions

CO-2 Evaluate expressions involving factorials and also calculate binomial coefficients, Expansion of Binomial, exponential and logarithmic series.

CO-3 Develop knowledge and skills in solving the problems in exponential and logarithmic series.

CO-4 To impart the knowledge of summation of series .Expansion of $\cos^n \theta$, $\sin^n \theta$, $\sin \theta$, $\cos \theta$, $\sin n\theta$, $\cos n\theta$, $\tan n\theta$ and $\tan(\theta_1 + \theta_2 + \dots + \theta_n)$ and Formation of Equation with trigonometry roots

CO-5 Learn to find roots of polynomial, Analyze the relation between circular and hyperbolic functions and Logarithms of complex numbers

Subject Name	Subject Code	CO-1	CO-2	CO-3	CO-4	CO-5
Algebra & Trigonometry	Unit-1	✓				
	Unit-2		✓	✓		
	Unit-3			✓	✓	
	Unit-4				✓	
	Unit-5					✓

PSO- CO MATRIX

Course	PSO-1 (Theory)	PSO-2 (Practical)	PSO-3 (Research, Higher studies)	PSO-4 (NET)	PSO-5 (Employment)
CO-1	✓		✓	✓	
CO-2	✓		✓	✓	
CO-3	✓		✓	✓	
CO-4	✓		✓	✓	
CO-5	✓		✓	✓	

Differential Calculus

(Subject Code) Course Outcome

CO-1. To learn about the rate of change of a quality with respect to other

CO-2. To find the minimum and minimum value of curve

CO-3. To find a function is increasing or decreasing function in a graph

CO-4. Application of derivatives is used to calculate the profit and loss in business using graphs

CO-5. To understand different method of finding asymptotes

Subject Name	Subject Code	CO-1	CO-2	CO-3	CO-4	CO-5
Differential Calculus	Unit-1	✓				
	Unit-2		✓			
	Unit-3			✓	✓	
	Unit-4				✓	
	Unit-5					✓

PSO- CO MATRIX

Course	PSO-1 (Theory)	PSO-2 (Practical)	PSO-3 (Research, Higher studies)	PSO-4 (NET)	PSO-5 (Employment)
CO-1	✓		✓		
CO-2	✓		✓	✓	
CO-3	✓		✓	✓	
CO-4	✓		✓	✓	
CO-5	✓		✓	✓	

Analytical Geometry in 2D & 3D

(Subject Code) Course Outcome

- CO-1.** Introduction of Straight Lines, Introduction about the three dimensional space
- CO-2.** Concept of a straight line and its properties, circles and tangent planes, Understand the properties of three dimensional space
- CO-3.** Polar equation of circle and straight line, Get the knowledge of line, plane and sphere
- CO-4.** The students are introduced to the concept of a line, Circles, parabola, Ellipse, hyperbola and its properties, circles and tangent planes, Express the problem geometrically in space
- CO-5.** Concepts of a plane, its various forms, determination of planes under given conditions. Obtain the geometrical knowledge of the cone

Subject Name	Subject Code	CO-1	CO-2	CO-3	CO-4	CO-5
Analytical Geometry in 2D & 3D	Unit-1	✓	✓		✓	
	Unit-2	✓				
	Unit-3		✓	✓	✓	
	Unit-4		✓		✓	
	Unit-5					✓

PSO- CO MATRIX

Course Subject Code	PSO-1 (Theory)	PSO-2 (Practical)	PSO-3 (Research, Higher studies)	PSO-4 (NET)	PSO-5 (Employment)
CO-1	✓				
CO-2	✓				
CO-3	✓			✓	
CO-4	✓			✓	
CO-5	✓		✓		

**Integral Calculus
(Subject Code) Course Outcome**

CO-1. Various techniques of integration. Applications of definite integrals

CO-2. Applications of integration. Various integration formulae

CO-3. Applications of improper integrals. Techniques of Beta, Gamma integrals

CO-4. Concepts of gradient, divergence curl and their properties

CO-5. Evaluation of line, volume and surface integrals and apply them to verify the Gauss Divergence, Greens and Stokes theorem

Subject Name	Subject Code	CO-1	CO-2	CO-3	CO-4	CO-5
Integral Calculus	Unit-1	✓				
	Unit-2		✓			
	Unit-3			✓		
	Unit-4				✓	
	Unit-5					✓

PSO- CO MATRIX

Course Subject Code	PSO-1 (Theory)	PSO-2 (Practical)	PSO-3 (Research, Higher studies)	PSO-4 (NET)	PSO-5 (Employment)
CO-1	✓				
CO-2	✓				
CO-3	✓			✓	
CO-4	✓			✓	
CO-5	✓		✓		

Vector calculus and its applications (**Subject Code**) Course Outcome

CO-1. Basic concept of Vector calculus

CO-2. To study the Concept of divergence, curl

CO-3. Problem solving skill of Line integrals.

CO-4. To understand the concept of surface integrals and volume integrals.

CO-5. Evaluation of line, volume and surface integrals and apply them to verify the Gauss Divergence, Greens and Stokes theorem.

Subject Name	Subject Code	CO-1	CO-2	CO-3	CO-4	CO-5
Vector calculus and its applications	Unit-1	✓				
	Unit-2		✓			
	Unit-3	✓	✓	✓		
	Unit-4					✓
	Unit-5				✓	

PSO- CO MATRIX

Course Subject Code	PSO-1 (Theory)	PSO-2 (Practical)	PSO-3 (Research, Higher studies)	PSO-4 (NET)	PSO-5 (Employment)
CO-1	✓				
CO-2	✓		✓		
CO-3	✓				
CO-4	✓				
CO-5	✓		✓		

Differential Equations and applications (**Subject Code**) Course Outcome

CO-1. Developing the skills of solving Differential Equation.

CO-2. Different method of solving Ordinary Differential Equation. Method of variation Parameter.

CO-3. Solving problems of Fourier series

CO-4. Solving Partial Differential Equations of first and second order.

CO-5. Formation of Partial Differential Equation, solving special types of first order Partial Differential Equation and boundary value problems.

Subject Code	CO-1	CO-2	CO-3	CO-4	CO-5
Unit-1	✓				
Unit-2	✓	✓			
Unit-3		✓			
Unit-4			✓		
Unit-5				✓	✓

PSO- CO MATRIX

Course Differential Equations and applications Subject Code	PSO-1 (Theory)	PSO-2 (Practical)	PSO-3 (Research, Higher studies)	PSO-4 (NET)	PSO-5 (Employment)
CO-1	✓		✓	✓	
CO-2	✓		✓	✓	
CO-3	✓		✓	✓	
CO-4	✓			✓	
CO-5	✓			✓	

Resource Management technique

(Subject Code) Course Outcome

CO-1. Learn basic concepts of operations research

CO-2. Obtaining Optimal Solutions.

CO-3. Solve problems in operations research

CO-4. Apply the concept of operations research

CO-5. Use mathematical software to solve the proposed model.

Subject Name	Subject Code	CO-1	CO-2	CO-3	CO-4	CO-5
Resource Management technique	Unit-1	✓		✓		✓
	Unit-2		✓	✓	✓	
	Unit-3			✓	✓	✓
	Unit-4		✓	✓	✓	✓
	Unit-5		✓	✓	✓	✓

PSO- CO MATRIX

Course Subject Code	PSO-1 (Theory)	PSO-2 (Practical)	PSO-3 (Research, Higher studies)	PSO-4 (NET)	PSO-5 (Employment)
CO-1	✓		✓	✓	✓
CO-2	✓		✓	✓	
CO-3	✓		✓	✓	
CO-4	✓		✓	✓	
CO-5	✓		✓	✓	

Elements of mathematical analysis

(Subject Code) Course Outcome

CO-1 To learn about basic knowledge of sets and functions

CO-2 To understand the concept of sequence of real numbers

CO-3 Get the knowledge of convergent and divergent sequence

CO-4 Studying the behavior of convergence of series by using tests.

CO-5 To understand the series of real numbers, limits and also the concept of metric space.

Subject Name	Subject Code	CO-1	CO-2	CO-3	CO-4	CO-5
Elements of mathematical analysis	Unit-1	✓				
	Unit-2		✓	✓		
	Unit-3			✓		
	Unit-4				✓	✓
	Unit-5					✓

PSO- CO MATRIX

Course Subject Code	PSO-1 (Theory)	PSO-2 (Practical)	PSO-3 (Research, Higher studies)	PSO-4 (NET)	PSO-5 (Employment)
CO-1	✓		✓	✓	
CO-2	✓		✓	✓	
CO-3	✓		✓	✓	
CO-4	✓		✓	✓	
CO-5	✓		✓	✓	

Abstract Algebra

(Subject Code) Course Outcome

- CO-1. Basic knowledge of Group Theory
- CO-2. Basic knowledge of ring theory
- CO-3. Solving problems in group theory
- CO-4. Solving problems in ring theory
- CO-5. Brief knowledge of field and Euclidean rings

Subject Name	Subject Code	CO-1	CO-2	CO-3	CO-4	CO-5
Abstract Algebra	Unit-1	✓		✓		
	Unit-2		✓		✓	
	Unit-3	✓		✓		
	Unit-4		✓		✓	
	Unit-5		✓		✓	✓

PSO- CO MATRIX

Course Subject Code	PSO-1 (Theory)	PSO-2 (Practical)	PSO-3 (Research, Higher studies)	PSO-4 (NET)	PSO-5 (Employment)
CO-1	✓		✓	✓	
CO-2	✓		✓	✓	
CO-3	✓		✓	✓	
CO-4	✓		✓	✓	
CO-5	✓		✓	✓	

Real Analysis

(Subject Code) Course Outcome

- CO-1. Basic Concepts of Functions and real number system.
- CO-2. Understanding of Continuous functions, Connected, Complete, Compact in Metric Spaces
- CO-3. To learn Concepts of Limits, Concepts of Metric Spaces
- CO-4. Introduction and Properties of Riemann Integral and Derivatives and their properties
- CO-5. Concept of Point wise and Uniform Convergence and its applications

Subject Name	Subject Code	CO-1	CO-2	CO-3	CO-4	CO-5
Real Analysis	Unit-1	✓				
	Unit-2	✓	✓			
	Unit-3	✓		✓		
	Unit-4		✓		✓	
	Unit-5					✓

PSO- CO MATRIX

Course Subject Code	PSO-1 (Theory)	PSO-2 (Practical)	PSO-3 (Research, Higher studies)	PSO-4 (NET)	PSO-5 (Employment)
CO-1	✓		✓	✓	
CO-2	✓		✓	✓	
CO-3	✓		✓	✓	
CO-4	✓		✓	✓	
CO-5	✓		✓	✓	

Mathematical modelling (Subject Code) Course Outcome

Co 1: Knowledge of Mathematical modeling.

Co 2: Applications of mathematical modelling

Co 3: Knowledge about ordinary differential equations.

Co 4: Applications of difference equation

Co 5: concept of mathematical modelling with difference equations

Subject Name	Subject Code	CO-1	CO-2	CO-3	CO-4	CO-5
Mathematical modelling	Unit-1	✓				
	Unit-2		✓			
	Unit-3	✓	✓	✓		
	Unit-4					✓
	Unit-5				✓	

PSO- CO MATRIX

Course Subject Code	PSO-1 (Theory)	PSO-2 (Practical)	PSO-3 (Research, Higher studies)	PSO-4 (NET)	PSO-5 (Employment)
CO-1	✓				
CO-2	✓		✓		
CO-3	✓				
CO-4	✓				
CO-5	✓		✓		

**Linear Algebra
(Subject Code) Course Outcome**

CO-1 Learn the elementary basic concepts of vector space

CO-2 Understand the concept of the dual space of vector space

CO-3 Learn the knowledge of Inner product space

CO-4 Advance concept of Algebra of Linear Transformations

CO-5 Analyze the concept of Characteristic roots, Matrices and canonical forms

Subject Name	Subject Code	CO-1	CO-2	CO-3	CO-4	CO-5
Linear Algebra	Unit-1	✓				
	Unit-2	✓	✓			
	Unit-3			✓		
	Unit-4	✓			✓	✓
	Unit-5					✓

PSO- CO MATRIX

Course Subject Code	PSO-1 (Theory)	PSO-2 (Practical)	PSO-3 (Research, Higher studies)	PSO-4 (NET)	PSO-5 (Employment)
CO-1	✓		✓	✓	
CO-2	✓		✓	✓	
CO-3	✓		✓	✓	
CO-4	✓		✓	✓	
CO-5	✓		✓	✓	

Complex Analysis

(Subject Code) Course Outcome

CO-1. Basic concept of complex-valued functions

CO-2. To learn the analyticity of the complex analysis

CO-3. Problem involving complex integration in a complex planes

CO-4. Learn series expansion

CO-5. Understanding concepts Foundations of Complex Analysis

Subject Name	Subject Code	CO-1	CO-2	CO-3	CO-4	CO-5
Complex Analysis	Unit-1	✓	✓	✓		✓
	Unit-2				✓	
	Unit-3	✓				
	Unit-4			✓	✓	
	Unit-5					✓

PSO- CO MATRIX

Course Subject Code	PSO-1 (Theory)	PSO-2 (Practical)	PSO-3 (Research, Higher studies)	PSO-4 (NET)	PSO-5 (Employment)
CO-1	✓		✓	✓	
CO-2	✓		✓	✓	
CO-3	✓		✓	✓	
CO-4	✓		✓	✓	
CO-5	✓		✓	✓	

MECHANICS (Subject Code) Course Outcome

CO-1. To understand the forces and equilibrium of a particle.

CO-2. To know the concept of force on a rigid body

CO-4. To know the concept of Work, energy power

CO-5. To know the applications of projectile and central orbits

Subject Code	CO-1	CO-2	CO-3	CO-4	CO-5
Unit-1	✓				✓
Unit-2		✓			
Unit-3			✓		✓
Unit-4				✓	
Unit-5					✓

PSO- CO MATRIX

Course	PSO-1 (Theory)	PSO-2 (Practical)	PSO-3 (Research, Higher studies)	PSO-4 (NET)	PSO-5 (Employment)
CO-1	✓				
CO-2	✓		✓	✓	
CO-3	✓		✓	✓	
CO-4	✓			✓	
CO-5	✓		✓		✓

Teaching-Learning Process

The program offers many manners of learning and assessment. Students have great freedom of choice of subjects which they can study. The components of teaching- learning process are follows

1. Lectures:

The universal method of communicating knowledge is through lectures. Some of lecture may possible through blackboard, power point presentation and other technologies.

2. Tutorials:

Tutorials resolving difficulties faced by the students in understanding the lecture. Tutorials are also aimed at solving problems associated with the concepts discussed during the lectures.

3. Practicals:

It helps to visualize and solving numerical problems in various areas in mathematics. The practical session provides vital insights into mathematical concepts and draw learner's attention towards limitations of numerical computations.

4. Prescribed textbooks:

A large number of books are included in both recommended and references of each course for enrichment and enhancement of knowledge.

5. E-learning resources:

Understanding Mathematical concepts in the effective manner, leaners can use and access electronic resources and websites.

6. Self-study materials:

By providing Self-study material by the instructors the gap between teaching and learning is fulfilled. Students can get the benefit for preparing examinations.

Assessment Methods:

1. Variety of assessment methods that are appropriate will be used to assess progress towards the course.
2. Priority will be accorded to formative assessment and its progress is assessed using time constrained examinations, closed book and open book tests problem-based assignments, observation of practical skills and seminar.
3. Assessment math tests focus on a student's analytical skills and the ability to integrate what they have learned along with creativity with written and oral skills.
4. A teacher can assess the student's real-world understanding and how the analytical processes relate by, in a quiz setting, requesting open responses, like a brief written or oral answer, a mathematical solution, a drawing, a diagram, chart or graph.
5. Process of testing learners in order to better understanding of math.

Keywords

LOCF, CBCS, Course Learning Outcomes, Employability, Graduate Attributes, Communication Skills, Critical Thinking, Remembering, Understanding, Analyzing, Evaluating, Creating.