



# AVS

## COLLEGE OF ARTS & SCIENCE (AUTONOMOUS)

Attur Main Road, Ramalingapuram, Salem - 106.

(Recognized under section 2(f) & 12(B) of UGC Act 1956 and  
Accredited by NAAC with 'A' Grade)

(Co - Educational Institution | Affiliated to Periyar University, Salem  
ISO 9001 : 2015 Certified Institution)

[principal@avscollege.ac.in](mailto:principal@avscollege.ac.in) | [www.avscollege.ac.in](http://www.avscollege.ac.in)

Ph : 98426 29322, 94427 00205.

Syllabus for

### B. Sc MATHEMATICS

CHOICE BASED CREDIT SYSTEM –

LEARNING OUTCOMES BASED CURRICULUM FRAMEWORK

(CBCS – LOCF)

(Applicable to the Candidates admitted from 2023-24 onwards)

## **VISION**

- To attain excellence in the field of education by creating competent scholars with a touch of human values.

## **MISSION**

- To accomplish eminence in the academic domain.
- To provide updated infrastructure.
- To educate value based education.
- To impart skills through efficient training programs.
- To cultivate culture and tradition with discipline and determination.

## REGULATIONS

### 1. Eligibility for Admission:

A Pass in the Higher Secondary Examination of Tamil Nadu Higher Secondary Board or some other Board accepted by the Syndicate as equivalent thereto with Mathematics (other than Business mathematics) as One of the subjects.

### 2. Duration:

The candidates shall complete all the courses of the programme within 5 years from the date of admission. The programme of study shall consist of six semesters and a total period of three years with 140 credits. The programme of study will comprise the course according to the syllabus.

### 3. Eligibility for award of degree:

No candidate shall be eligible for conferment of the Degree unless he / she

- i) Has undergone the prescribed course of study for a period of not less than six semesters in an institution approved by/affiliated to the University or has been exempted from in the manner prescribed and has passed the examinations as have been prescribed the refer.
- ii) Has completed all the components prescribed under Parts I to Part V in the CBCS pattern to earn 140 credits.
- iii) Has successfully completed the prescribed Field Work/ Institutional Training as evidenced by certificate issued by the Principal of the College.

### 4. Course of Study:

Program means a course of study leading to the award of the degree in a discipline.

Course refers to the subject offered under the degree programme.

### 5. Scheme of Examination:

The course of study shall be based on semester pattern with Internal Assessment under Choice Based Credit System.

The examinations for all the papers consist of both Internal (Continuous Internal Assessment CIA) and External (end semester) theory examination.

The theory examination shall be conducted for three hours duration at the end of each semester

The candidates failing in any subjects(s) will be permitted to appear for the same in the subsequent semester examinations.

### 6. Passing Rules:

The Candidates shall be declared to have passed the examination if he/she

#### i) Theory

Secures not less than 40 marks in total (CIA mark + Theory Exam mark) with minimum of 30 marks in the

Theory Exam conducted by the University.

**ii) Practical**

Secures not less than 40 marks in total (CIA mark + Practical Exam mark) with minimum of 18 marks out of 45 marks in the Practical Exam conducted by the University.

<b>Programme Outcomes (POs)</b>	
On successful completion of the B. Sc Mathematics	
<b>PO1</b>	Disciplinary Knowledge: Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate programme of study.
<b>PO2</b>	Critical Thinking: Capability to apply analytic thought to a body of knowledge; analyze and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach to knowledge development.
<b>PO3</b>	Problem Solving: Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply one's learning to real life situations.
<b>PO4</b>	Analytical Reasoning: Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyze and synthesize data from a variety of sources; draw valid conclusions and support them with evidence and examples and addressing opposing viewpoints.
<b>PO5</b>	Scientific Reasoning: Ability to analyze, interpret and draw conclusions from quantitative / qualitative data; and critically evaluate ideas, evidence, and experiences from an open minded and reasoned perspective.
<b>PO6</b>	Self-directed & Lifelong Learning: Ability to work independently, identify and manage a project. Ability to acquire knowledge and skills, including "learning how to learn", through self-placed and self-directed learning aimed at personal development, meeting economic, social and cultural objectives.

<b>Program Specific Outcomes (PSOs)</b>	
After the successful completion of B. Sc Mathematics programme the students are expected to	
<b>PSO1</b>	Acquire good knowledge and understanding, to solve specific theoretical & applied problems in different area of mathematics & statistics.
<b>PSO2</b>	Understand, formulate, develop mathematical arguments, logically and use quantitative models to address issues arising in social sciences, business and other context /fields.
<b>PSO3</b>	To prepare the students who will demonstrate respectful engagement with other's ideas, behaviors, beliefs and apply diverse frames of references to decisions and actions. To create effective entrepreneurs by enhancing their critical thinking, problem solving, decision making and leadership skill that will facilitate startups and high potential organizations.

**Programme Educational Objectives (PEOs)**

The B. Sc Mathematics programme describes accomplishments that graduates are expected to attain within five to seven years after graduation.

<b>PEO1</b>	The graduates will be well prepared for successful careers at Local, National and International level, and can work as analyst, quality controller, research assistant at various organizations.
<b>PEO2</b>	The graduates will provide leadership and lifelong learning qualities required for a successful professional career along with ethical attitude and teamwork skills.
<b>PEO3</b>	The graduates will be able to formulate, investigate and analyze scientifically real life problems along with ethical attitude.
<b>PEO4</b>	The graduates will engage in professional activities to enhance their own stature and simultaneously contribute to the profession and the society at large.
<b>PEO5</b>	The graduates will be successful in higher education in sciences and in management, if pursued.

**CREDIT DISTRIBUTION FOR 3 YEARS B. Sc MATHEMATICS PROGRAMME**

Part	Course Type	Credits per Course	No. of Papers	Total Credits
Part I	Language – I (Tamil/Hindi/French)	3	4	12
Part II	Language – II (English)	3	4	12
Part III	Core Courses- Theory	4	15	60
	Core Courses- Practical			
	Major Elective Courses- Theory	3	4	12
	Major Elective Courses- Practical	1	1	1
	Generic Discipline Specific/ Allied Courses - Theory	4	4	16
	Generic Discipline Specific/ Allied Courses - Practical	1	2	2
	Generic Discipline Specific/ Allied Courses - Practical	2	1	2
<b>Total</b>				<b>117</b>
Part IV	Non Major Elective Courses	2	2	4
	Skill Enhancement Courses	2	3	6
	Skill Enhancement Courses	1	1	1
	Skill Enhancement Courses (Practical)	2	1	2
	Professional Competency Skill Enhancement Course	2	1	2
	Foundation course	2	1	2
	EVS (Environmental Studies)	-	-	-
	Value Education	2	1	2
	Internship	2	1	2
	Field Project	-	-	-
	MOOC/ SWAYAM/ NPTEL Courses	2	1	2
<b>Total</b>				<b>23</b>
Part V	Extension Activity (NSS/NCC/Physical Education)	1	1	1
Part VI	Naan Mudhalvan Scheme (Online Examination & Project work)	-	-	-
<b>Total Credits</b>				<b>141</b>

**CONSOLIDATED SEMESTER WISE AND COMPONENT WISE CREDIT DISTRIBUTION  
FOR 3 YEARS B. Sc MATHEMATICS PROGRAMME**

Parts	Semester I	Semester II	Semester III	Semester IV	Semester V	Semester VI	Total Credits
Part I	3	3	3	3	-	-	12
Part II	3	3	3	3	-	-	12
Part III	14	13	13	13	22	18	93
Part IV	4	4	3	6	4	3	24
Part V	-	-	-	-	-	-	-
<b>Total</b>	<b>24</b>	<b>23</b>	<b>22</b>	<b>25</b>	<b>26</b>	<b>21</b>	<b>141</b>

\*Part I, II and Part III components will be separately taken into account for CGPA calculation and classification for the under graduate programmes and the other components IV and V have to be completed during the duration of the programmes as per the norms, to be eligible for obtaining the UG degree.

**METHOD OF EVALUATION**

Evaluation	Components	Marks
Internal Evaluation	Continuous Internal Assessment Test	15
	Assignments	3
	Class Participation	2
	Distribution of marks for Attendance (in percentage) 96 – 100: 5 Marks 91 – 95: 4 Marks 86 – 90: 3 Marks 81 – 85: 2 Marks	5
External Evaluation	End Semester Examination	75 Marks
<b>Total</b>		<b>100 Marks</b>

**Note:** 1.UG Programmes- A candidate must score minimum 10 marks in Internal and 30 marks in External Evaluation.

2. PG Programmes- A candidate must score minimum 13 marks in Internal and 38 marks in External Evaluation.



## CONTINUOUS INTERNAL ASSESSMENT

### Categorizing Outcome Assessment Levels Using Bloom's Taxonomy

level	Cognitive Domain	Description
K1	Remember	It is the ability to remember the previously learned concepts or ideas.
K2	Understand	The learner explains concepts or ideas.
K3	Apply	The learner uses existing knowledge in new contexts.
K4	Analyze	The learner is expected to draw relations among ideas and to compare and contrast.
K5	Evaluate	The learner makes judgements based on sound analysis.
K6	Create	The learner creates something unique or original.

### Question Paper Blue Print for Continuous Internal Assessment- I & II

Duration: 2 Hours		Maximum: 50 marks					
Section	K level						Marks
	K1	K2	K3	K4	K5	K6	
A (no choice)	10						10 X 1 = 10
B (no choice)		1	1				2 X 5 = 10
C (either or choice)				3			3 x 10 = 30
Total							50 marks

*Note: K4 and K5 levels will be assessed in the Model Examination whereas K5 and K6 Levels will be assessed in the End Semester Examinations.*

## Question Paper Blue Print for Continuous Internal Assessment- I

Time: 2 Hours

Total Marks: 50 Marks

Minimum Pass: 20 Marks

Unit	Section - A	Section - B	Section - C
I	Q.N. 1, 2, 3, 4, 5	Q.N. 11	Q.N. 13 A, 13 B
I or II	-	-	Q.N. 14 A, 14 B
II	Q.N. 6, 7, 8, 9, 10	Q.N. 12	Q.N. 15 A, 15 B

### SECTION – A (10 X 1 = 10 Marks)

ANSWER ALL THE QUESTIONS

### SECTION – B (2 X 5 = 10 Marks)

ANSWER ALL THE QUESTIONS

### SECTION – C (3 X 10 = 30 Marks)

ANSWER ALL THE QUESTIONS (Either or Choice)

## Question Paper Blue Print for Continuous Internal Assessment- II

Time: 2 Hours

Total Marks: 50 Marks

Minimum Pass: 20 Marks

Unit	Section - A	Section - B	Section - C
III	Q.N. 1, 2, 3, 4, 5	Q.N. 11	Q.N. 13 A, 13 B
III or IV	-	-	Q.N. 14 A, 14 B
IV	Q.N. 6, 7, 8, 9, 10	Q.N. 12	Q.N. 15 A, 15 B

### SECTION – A (10 X 1 = 10 Marks)

ANSWER ALL THE QUESTIONS

### SECTION – B (2 X 5 = 10 Marks)

ANSWER ALL THE QUESTIONS

### SECTION – C (3 X 10 = 30 Marks)

ANSWER ALL THE QUESTIONS (Either or Choice)

**Question Paper Blue Print for Model Examination & End Semester Examination**

Duration: 3 Hours		Maximum: 75 marks						
Section	K level						Marks	
	K1	K2	K3	K4	K5	K6		
A (no choice, three questions from each unit)		15						15 X 1 =15
B (choice, one question from each unit)			1	1				2 X 5 =10
C (either or choice & two questions from each unit)	<i>Courses with K4 as the highest cognitive level</i>				4	1		5 x 10 = 50
	<i>Course with K5 as the highest cognitive level wherein three K4 questions and two K5 questions are compulsory.</i>				3	2		
	<i>Course with K6 as the highest cognitive level wherein two questions each on K4, K5 and one question on K6 are compulsory.</i>				2	2	1	
Total								75 marks

**Question Paper Blue Print for Model Examination & End Semester Examination**

Time: 2 Hours

Total Marks: 75 Marks

Minimum Pass: 30 Marks

Unit	Section - A	Section - B	Section - C
I	Q.N. 1, 2, 3	Q.N. 16	Q.N. 21 A, 21 B
II	Q.N. 4, 5, 6	Q.N. 17	Q.N. 22 A, 22 B
III	Q.N. 7, 8, 9	Q.N. 18	Q.N. 23 A, 23 B
IV	Q.N. 10, 11, 12	Q.N. 19	Q.N. 24 A, 24 B
V	Q.N. 13, 14, 15	Q.N. 20	Q.N. 25 A, 25 B

**SECTION – A (15 X 1 = 15 Marks)**

ANSWER ALL THE QUESTIONS

**SECTION – B (2 X 5 = 10 Marks)**

ANSWER ANY TWO QUESTIONS

**SECTION – C (5 X 10 = 50 Marks)**

ANSWER ALL THE QUESTIONS (Either or Choice)

**Question Paper Blue Print for Model Practical Examination & End Semester Examination (Practical)**

Time: 3 Hours

Total Marks: 60 Marks

Minimum Pass: 24 Marks

<b>Practical Marks</b>	<b>Maximum Mark</b>	<b>Minimum Mark</b>
Internal	40	16
External	60	24
Total	100	40

**Evaluation for End Semester Examinations (Practical)**

Record	10 marks
Formula with expansion	05 marks
Observation with data	20 marks
Viva-voce	05 marks
Calculation	15 marks
Result with units	05 marks
<b>TOTAL</b>	<b>60 MARKS</b>

\*Submission of record with due certification is a must for external practical examinations.

\*\*A student should complete all requires experiments to get 10 marks for the record.

## Scheme of Examination for B. Sc Mathematics

### First Year – Semester - I

Part	Course Code	Course Title	Ins. Hrs	Credit	CIA	ESE	Total
I	23UFTA01	Podhu Tamil - I	4	3	25	75	100
II	23UFEN01	General English - I	4	3	25	75	100
III	23UMACT01	Core I - Algebra & Trigonometry	4	4	25	75	100
III	23UMACT02	Core II - Differential Calculus	4	4	25	75	100
III	23UPHA01	Elective Course - I Allied Physics-I	4	4	25	75	100
III	23UPHAP01	Allied Physics Practical - I	2	2	40	60	100
IV	23UMAF01	Foundation Course - Bridge Mathematics	2	2	25	75	100
IV	23UTANE01	Non Major Elective Course – Pechukalai Thiran	1	2	25	75	100
<b>Total</b>			<b>25</b>	<b>24</b>			

### First Year – Semester - II

Part	Course Code	Course Title	Ins. Hrs	Credit	CIA	ESE	Total
I	23UFTA02	Podhu Tamil - II	4	3	25	75	100
II	23UFEN02	General English - II	4	3	25	75	100
III	23UMACT03	Core III - Analytical Geometry (Two & Three Dimensions)	4	4	25	75	100
III	23UMACT04	Core IV- Integral Calculus	4	4	25	75	100
III	23UPHA02	Elective Course II - Allied Physics - II	4	3	25	75	100
III	23UPHAP02	Allied Physics Practical - II	2	2	40	60	100
IV	23UMASE03	Skill Enhancement Course - III Computational Mathematics	2	2	25	75	100
IV	23UBXNE002	Non Major Elective Course – Managerial Skill Development	1	2	25	75	100
<b>Total</b>			<b>25</b>	<b>23</b>			

### Second Year – Semester - III

Part	Course Code	Course Title	Ins. Hrs	Credit	CIA	ESE	Total
I	23UFTA03	Podhu Tamil - III	4	3	25	75	100
II	23UFEN03	General English - III	4	3	25	75	100
III	23UMACT05	Core V- Vector Calculus and its Applications	5	4	25	75	100
III	23UMACT06	Core VI - Differential Equations and its Applications	4	4	25	75	100
III	23USTAT01	Elective Course III - Allied Statistical Methods – I	4	5	25	75	100
IV	23UMASE04	Skill Enhancement Course IV - Statistics with Excel Programming	1	1	25	75	100
IV	23UMASE05	Skill Enhancement Course V - Mathematics For Competitive Examinations - III	2	2	25	75	100
IV		Environmental Studies	1	-	25	75	100
<b>Total</b>			<b>25</b>	<b>22</b>			

### Second Year – Semester - IV

Part	Course Code	Course Title	Ins. Hrs	Credit	CIA	ESE	Total
I	23UFTA04	Podhu Tamil - IV	4	3	25	75	100
II	23UFEN04	General English - IV	4	3	25	75	100
III	23UMACT07	Core VII - Industrial Statistics	3	4	25	75	100
III	23UMACT08	Core VIII - Elements of Mathematical Analysis	4	4	25	75	100
III	23USTAT02	Elective Course IV - Allied - Statistical Methods – II	3	3	25	75	100
III	23USTAP01	Allied – Statistics Practical	2	2	40	60	100
IV	23UMASE06	Skill Enhancement Course VI - Mathematics For Competitive Examinations - IV	2	2	25	75	100
IV	23UMASE07	Skill Enhancement Course - VII LaTeX Practical	2	2	25	75	100
IV		Environmental Studies	1	2	25	75	100
<b>Total</b>			<b>25</b>	<b>25</b>			

### Third Year – Semester -V

Part	Course Code	Course Title	Ins. Hrs	Credit	CIA	ESE	Total
III	23UMACT09	Core IX - Abstract Algebra	4	4	25	75	100
III	23UMACT10	Core X - Real Analysis	4	4	25	75	100
III	23UMACT11	Core XI - Mathematical Modeling	4	4	25	75	100
III	23UMACT12	Core XII - Optimization Techniques	4	4	25	75	100
III	23UMAME01	Elective Course – V (From Group-I) Numerical Methods with Application	4	3	25	75	100
III	23UMAME05	Elective Course – VI (From Group-II) Discrete Mathematics	4	3	25	75	100
IV		Value Education Yoga	1	2	25	75	100
IV		Internship / Industrial Training (Summer vacation at the end of IV semester activity)	-	2	25	75	100
<b>Total</b>			<b>25</b>	<b>26</b>			

### Third Year – Semester -VI

Part	Course Code	Course Title	Ins. Hrs	Credit	CIA	ESE	Total
III	23UMACT13	Core XIII - Linear Algebra	5	4	25	75	100
III	23UMACT14	Core XIV - Complex Analysis	5	4	25	75	100
III	23UMACT15	Core XV - Mechanics	5	4	25	75	100
III	23UMAME02	Elective Course – VII (From Group-I) Number Theory	4	3	25	75	100
III	23UMAME06	Elective Course – VIII (From Group-II) Graph Theory with Application	4	3	25	75	100
IV	23UMAPC01	Professional Competency Skill - Statistics with R Programming	2	2	25	75	100
IV		Extension Activity	-	1	25	75	100
<b>Total</b>			<b>25</b>	<b>21</b>			

**\*\*Ins. Hrs** – Instructional Hours, **CIA**- Continuous Internal Assessment, **ESE**- End Semester Examination



<b>Semester: I</b>	<b>Course Code: 23UMAF01</b>	<b>Hours/Week: 2</b>	<b>Credit: 2</b>
<b>COURSE TITLE : FOUNDATION COURSE - BRIDGE MATHEMATICS</b>			

**Course Overview:**

1. The objective of the course was to provide adequate foundation in Mathematics which is a prerequisite for learning Mathematics in higher education and to bridge the gap between Math learnt in schools and the Math to be learnt in college.

**Learning Objectives:**

1. To bridge the gap and facilitate transition from higher secondary to tertiary education;
2. To instill confidence among stakeholders and inculcate interest for Mathematics;

<b>Unit - I</b>	<b>Algebra</b>	<b>09 Hours</b>
-----------------	----------------	-----------------

Binomial theorem, General term, middle term, problems based on these concepts NCERT -(11<sup>th</sup> standard)[Chapter -8, Page No: 160-176]

<b>Unit - II</b>	<b>Sequences and series (Progressions)</b>	<b>09 Hours</b>
------------------	--	-----------------

Fundamental principle of counting. Factorial n. NCERT -(11<sup>th</sup> standard)[Chapter -9 , PageNo: 177-196]

<b>Unit - III</b>	<b>Permutations and combinations</b>	<b>09 Hours</b>
-------------------	--------------------------------------	-----------------

Permutations and combinations, Derivation of formulae and their connections, simple applications, combinations with repetitions, arrangements within groups, formation of groups. Volume I (11<sup>th</sup> standard) [Chapter -4, Sec. 4.4-4.5 Page No:167-186]

<b>Unit - IV</b>	<b>Trigonometry</b>	<b>09 Hours</b>
------------------	---------------------	-----------------

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

Volume I (11<sup>th</sup> standard)

[Chapter -3, Sec. 3.5, 3.5.2, 3.5.3 Page No: 104-122]

[Chapter -3, Sec. 3.7.1-3.7.2 Page No: 134-137]

Inverse trigonometric functions, sine rule and cosine rule Volume I (12<sup>th</sup> standard) [Chapter -4, Page No: 132-142]

<b>Unit - V</b>	<b>Calculus</b>	<b>09 Hours</b>
-----------------	-----------------	-----------------

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.

Volume II (11<sup>th</sup> standard)

[Chapter -9, Sec. 9.2.1, 9.2.10 Page No: 88-103]

[Chapter -10, Sec. 10.2.3 Page No: 114-118]

[Chapter -11, Sec. 11.7 Page No: 196-209]

### Text Book(s):

1. NCERT class XI text books. First edition February 2006 ,reprint 2019. Unit I & II.
2. State Board Mathematics text books of class XI, Volume – 1 .Revised edition 2019 , 2020. UNIT III,
3. State Board Mathematics text books of class XI , volume -1 revised edition 2019, 2020 and class XII volume- 1 revised edition 2020, 2022 UNIT IV,
4. State Board Mathematics text books of class XI , volume -2 revised edition 2019 , UNIT V.

### Reference Books:

1. State Board Mathematics text books of class XI , volume -1 revised edition 2019, 2020 and class XII volume- 1 revised edition 2020, 2022

### Web Resources:

1. <https://nptel.ac.in>

**Teaching Methodology:** Videos, Audios, PPT, Role Play, Field Visit, Seminar, Chalk & Talk, Lecturing, Case Study, Demonstration, Problem Solving, Group Discussion, Flipped Learning

<b>Learning Outcomes:</b> Upon successful completion of this course, the student will be able to		
<b>COs</b>	<b>Statements</b>	<b>Bloom's Level</b>
CO1	Prove the binomial theorem and apply it to find the expansions of any $(x + y)^n$ and also, solve the related problems.	K1
CO2	Find the various sequences and series and solve the problems related to them. Explain the principle of counting.	K2
CO3	Find the number of permutations and combinations in different cases. Apply the principle of counting to solve the problems on permutations and combinations.	K3
CO4	Find the number of permutations and combinations in different cases. Apply the principle of counting to solve the problems on permutations and combinations.	K4
CO5	Find the limit and derivative of a function at a point, the definite and indefinite integral of a function. Find the points of min/max of a function.	K5
K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create		

<b>Mapping (COs vs POs)</b>								
	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>
<b>CO1</b>	L	L	L	L	L	L	L	M
<b>CO2</b>	M	L	L	M	M	L	L	L
<b>CO3</b>	M	L	L	M	M	L	M	L
<b>CO4</b>	L	L	L	L	L	L	M	L
<b>CO5</b>	L	L	L	L	L	L	M	L

**S - Strong, M – Medium, L – Low**

<b>Semester: I</b>	<b>Course Code: 23UMACT01</b>	<b>Hours/Week: 4</b>	<b>Credit: 4</b>
<b>COURSE TITLE : CORE I - ALGEBRA &amp; TRIGONOMETRY</b>			

**Course Overview:**

1. This course covers the essentials of functions (linear, quadratic, polynomial, logarithmic, exponential, and trigonometric), graphing, solving equations and inequalities, systems of equations, and sequences and series.

**Learning Objectives:**

1. Basic ideas on the Theory of Equations, Matrices and Number Theory.
2. Knowledge to find expansions of trigonometry functions, solve theoretical and applied problems.

<b>Unit - I</b>	<b>Reciprocal Equations</b>	<b>09 Hours</b>
-----------------	-----------------------------	-----------------

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. (Book1 – Chapter6: Sections 16, 17, 19, 30).

<b>Unit - II</b>	<b>Summation of Series</b>	<b>09 Hours</b>
------------------	----------------------------	-----------------

Summation of Series: Binomial– Exponential – Logarithmic series (Theorems without proof) – Approximations - related problems. (Book1 – Chapter3: Sections 10, 14; Chapter4: Sections -1, 2, 3, 5, 7, 8, 9.11).

<b>Unit - III</b>	<b>Inverse of a square matrix up to order 3</b>	<b>09 Hours</b>
-------------------	---	-----------------

Inverse of a square matrix up to order 3, Characteristic equation – Eigen values and Eigen Vectors - Similar matrices - Cayley – Hamilton Theorem (Statement only) - Finding powers of square matrix, Diagonalization of square matrices - related problems. (Book2 – Chapter2: Sections -8,16).

<b>Unit - IV</b>	<b>Expansions of <math>\sin n\theta</math>, <math>\cos n\theta</math> in powers of <math>\sin\theta</math>, <math>\cos\theta</math></b>	<b>09 Hours</b>
------------------	---	-----------------

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  $\theta$  - related problems. (Book3 - Chapter3: Sections 1 to 5).

<b>Unit - V</b>	<b>Hyperbolic functions</b>	<b>09 Hours</b>
-----------------	-----------------------------	-----------------

Hyperbolic functions – Relation between circular and hyperbolic functions Inverse hyperbolic functions, Logarithm of complex quantities, Summation of trigonometric series - related problems. (Book3 - Chapter4; Chapter5; Chapter6: Sections 1, 3, 3.1 Related problems.)

**Text Book(s):**

1. Manickavasagam Pillai, T.K., T. Natarajan and Ganapathy KS – Algebra Vol-I, Viswanathan Publishers and Printers Pvt Ltd., - 2008.
2. Manickavasagam Pillai, T.K., T. Natarajan and Ganapathy KS – Algebra Vol-II, Viswanathan Publishers and Printers Pvt Ltd., - 2008.
3. Manichavasagam Pillai, T.K. and S. Narayanan, Trigonometry – Viswanathan Publishers and Printers Pvt. Ltd. 2013.

**Reference Books:**

1. W.S. Burnstine and A.W. Panton, Theory of equations
2. David C. Lay, Linear Algebra and its Applications, 3rd Ed., Pearson Education Asia, Indian Reprint, 2007
3. G.B. Thomas and R.L. Finney, Calculus, 9th Ed., Pearson Education, Delhi, 2005
4. C.V.Durell and A. Robson, Advanced Trigonometry, Courier Corporation, 2003

**Web Resources:**

1. <https://nptel.ac.in>

**Teaching Methodology:** Videos, Audios, PPT, Role Play, Field Visit, Seminar, Chalk & Talk, Lecturing, Case Study, Demonstration, Problem Solving, Group Discussion, Flipped Learning

**Learning Outcomes:**

Upon successful completion of this course, the student will be able to

COs	Statements	Bloom's Level
CO1	Classify and Solve reciprocal equations	K1
CO2	Find the sum of binomial, exponential and logarithmic series	K2
CO3	Find Eigen values, eigen vectors, verify Cayley – Hamilton theorem and diagonalize a given matrix	K3
CO4	Expand the powers and multiples of trigonometric functions in terms of sine and cosine	K4
CO5	Determine relationship between circular and hyperbolic functions and the summation of trigonometric series	K5
K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create		

Mapping (COs vs POs)									
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	S	L	S	-	-	-	S	M	L
CO2	M	L	S	L	-	-	S	M	L
CO3	S	L	S	L	-	-	S	M	L
CO4	S	L	S	-	-	-	S	M	L
CO5	S	L	S	-	-	-	S	M	L

S - Strong, M – Medium, L – Low

Semester: I	Course Code: 23UMACT02	Hours/Week: 4	Credit: 4
<b>COURSE TITLE : CORE II - DIFFERENTIAL CALCULUS</b>			

#### Course Overview:

1. Differential Calculus courses aims to provide quality training for everyone—from individual learners seeking personal growth to corporate teams looking to up skill.
2. For those pursuing professional advancement, skill acquisition, or even a new career path, these Differential Calculus courses can be a valuable resource.

#### Learning Objectives:

1. Basic ideas on the Theory of Equations, Matrices and Number Theory. • The basic skills of differentiation, successive differentiation, and their applications.
2. Basic knowledge on the notions of curvature, evolutes, involutes and polar co-ordinates and in solving related problems.

<b>Unit - I</b>	<b>Successive Differentiation</b>	<b>09 Hours</b>
-----------------	-----------------------------------	-----------------

Introduction (Review of basic concepts) – The  $n^{\text{th}}$  derivative – Standard results Fractional expressions – Trigonometrically transformation – Formation of equations involving derivatives - Leibnitz formula for the  $n^{\text{th}}$  derivative of a product. (Chapter3: Sections 1.1 to 1.6 and 2.1, Related problems.)

<b>Unit - II</b>	<b>Partial Differentiation</b>	<b>09 Hours</b>
------------------	--------------------------------	-----------------

Partial derivatives – Successive partial derivatives – Function of a function rule – Total differential coefficient – A special case – Implicit Functions. (Chapter8: Sections 1.1 to 1.5.)

<b>Unit - III</b>	<b>Partial Differentiation (Continued)</b>	<b>09 Hours</b>
-------------------	--	-----------------

Homogeneous functions – Partial derivatives of a function of two variables – Maxima and Minima of functions of two variables - Lagrange’s method of undetermined multipliers. (Chapter8: Sections 1.6, 1.7 and Sections 4, 5.)

<b>Unit - IV</b>	<b>Envelope</b>	<b>09 Hours</b>
------------------	-----------------	-----------------

Method of finding the envelope – Another definition of envelope – Envelope of family of curves which are quadratic in the parameter. (Chapter10: Sections 1.1 to 1.4.)

<b>Unit - V</b>	<b>Curvature</b>	<b>09 Hours</b>
-----------------	------------------	-----------------

Definition of Curvature – Circle, Radius and Centre of Curvature – Cartesian formula for the radius of curvature – The coordinates of the centre of curvature - Evolutes and Involutives – Radius of Curvature in Polar Co-ordinates. (Chapter10: Sections 2.1 to 2.6 )

#### **Text Book(s):**

1. S. Narayanan and T.K. Manicavachagom Pillay, Calculus -Volume I,(2004), S. Viswananthan Printers Pvt. Ltd.

#### **Reference Books:**

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

#### **Web Resources:**

1. <https://onlinecourses.nptel.ac.in>
2. <https://www.mooc-list.com/tags/differential-calculus>
3. [https://onlinecourses.swayam2.ac.in/cec19\\_ma02/preview](https://onlinecourses.swayam2.ac.in/cec19_ma02/preview)
4. <https://www.khanacademy.org/math/differential-calculus>

**Teaching Methodology:** Videos, Audios, PPT, Role Play, Field Visit, Seminar, Chalk & Talk, Lecturing, Case Study, Demonstration, Problem Solving, Group Discussion, Flipped Learning

**Learning Outcomes:**

Upon successful completion of this course, the student will be able to

COs	Statements	Bloom's Level
CO1	Find the nth derivative, form equations involving derivatives and apply Leibnitz formula	K1
CO2	Find the partial derivative and total derivative coefficient	K2
CO3	Determine maxima and minima of functions of two variables and to use the Lagrange's method of undetermined multipliers	K3
CO4	Find the envelope of a given family of curves	K4
CO5	Find the evolutes and involutes and to find the radius of curvature using polar co- ordinates	K5

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

**Mapping (COs vs POs)**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	L	M	M	S	S	S	L	M	M
CO2	M	L	M	-	-	-	M	M	L
CO3	M	L	M	-	-	-	M	M	L
CO4	M	M	M	M	-	-	M	M	L
CO5	M	M	M	M	L	-	M	M	L

S - Strong, M – Medium, L – Low



<b>Semester: I</b>	<b>Course Code: 23UMAAT01</b>	<b>Hours/Week: 5</b>	<b>Credit: 4</b>
<b>COURSE TITLE : ALLIED MATHEMATICS-I: ALGEBRA AND CALCULUS (FOR B. SC PHYSICS / B. SC CHEMISTRY)</b>			

**Course Overview:**

1. This is a course covering the elementary methods necessary for mathematical modelling. Emphasis will be placed on developing facility, technique and use in applications.

**Learning Objectives:**

1. To learn the basic concepts and problem solving in Theory of equations.
2. Develop the ability of solving the Integrals.

<b>Unit – I</b>	<b>Theory of Equations</b>	<b>09 Hours</b>
-----------------	----------------------------	-----------------

Imaginary roots – Irrational roots – Formation of equations – Solutions of equations – Diminishing the roots of an equation & solutions – Removal of the second term of an equation & solutions – Descartes’ rule of sign – Problems only. (Chapter6: Sections 4,9,10 & 11)

<b>Unit – II</b>	<b>Matrices</b>	<b>09 Hours</b>
------------------	-----------------	-----------------

Definition of Characteristic equation of a matrix – Characteristic roots of a matrix - Eigen values and the Corresponding Eigen vectors of matrix – Cayley Hamilton theorem (Statement only) – Verifications of Cayley Hamilton Theorem – Problems only. (Chapter 5)

<b>Unit - III</b>	<b>Radius of Curvature</b>	<b>09 Hours</b>
-------------------	----------------------------	-----------------

Formula of Radius of Curvature in Cartesian coordinates, Parametric coordinates and Polar coordinates (no proof for formulae) – Problems only. (Chapter11)

<b>Unit - IV</b>	<b>Partial Differential Equations</b>	<b>09 Hours</b>
------------------	---------------------------------------	-----------------

Formation of Partial Differential Equations by eliminating the arbitrary constant and arbitrary functions – Lagrange’s Linear Partial Differential Equations – Problems only. (Chapter26)

<b>Unit – V</b>	<b>Integration</b>	<b>09 Hours</b>
-----------------	--------------------	-----------------

Definite Integral : Simple properties of definite Integrals(Chap -15) – Bernoulli’s Formula – Integration by parts – Simple problems ; Reduction formula for  $\int \frac{1}{\sqrt{a^2 - x^2}}$ ,  $\int \frac{1}{\sqrt{x^2 - a^2}}$ ,  $\int \frac{1}{\sqrt{ax^2 + bx + c}}$ ,  $\int \frac{1}{x^2 + a^2}$ ,  $\int \frac{1}{x^2 - a^2}$  simple problems. (Chapter16)

**Text Book(s):**

1. Dr. P.R. Vittal, Allied Mathematics , Margham publication, Chennai – 17, Reprint 2016

**Reference Books:**

1. S.G Venkatachalapathi, Allied Mathematics, Margham publication, Chennai – 17, Reprint 2011.
2. P. Kandasamy, K. Thilagavathy, Allied Mathematics Volume I, S. Chand publication, July 2012

**Web Resources:**

1. [https://onlinecourses.nptel.ac.in/noc21\\_ma16/preview](https://onlinecourses.nptel.ac.in/noc21_ma16/preview)
2. <https://www.udemy.com/course/free-algebra-and-calculus-maths/>

**Teaching Methodology:** Videos, Audios, PPT, Role Play, Field Visit, Seminar, Chalk & Talk, Lecturing, Case Study, Demonstration, Problem Solving, Group Discussion, Flipped Learning

**Learning Outcomes:**

Upon successful completion of this course, the student will be able to

COs	Statements	Bloom's Level
CO1	Explain in detail about Imaginary roots, irrational roots and formation of equations and Descartes' rule of sign	K1
CO2	Explain Characteristic equation and roots of the matrix and Eigen values and Eigen vector of the matrix and Verification of Cayley Hamilton theorem.	K2
CO3	Explain Formula for Radius of curvature in Cartesian coordinates and Parametric coordinates and Polar coordinates.	K3
CO4	Explain Formation of Partial Differential Equations by eliminating the arbitrary constant and arbitrary functions	K4
CO5	Explain Simple properties of definite Integrals and Bernoulli's Formula and Integration by parts.	K5

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

**Mapping (COs vs POs)**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	S	M	S	-	-	-	S	M	M
CO2	M	L	S	L	-	-	S	M	L
CO3	S	L	S	L	-	-	S	M	L
CO4	S	L	S	-	-	-	S	M	L
CO5	S	L	S	-	-	-	S	M	L

S - Strong, M – Medium, L – Low

<b>Semester: I</b>	<b>Course Code: 23UMAEGS05</b>	<b>Hours/Week: 5</b>	<b>Credit: 3</b>
<b>COURSE TITLE : INTRODUCTION TO LINEAR ALGEBRA (FOR ALL COMPUTER SCIENCE DEPARTMENTS)</b>			

**Course Overview:**

1. It includes vectors, matrices and linear functions. It is the study of linear sets of equations and its transformation properties.

**Learning Objectives:**

1. Develop the ability of solving the Partial fraction, Binomial Series Exponential series and Logarithms Series
2. Acquire knowledge about Matrices and Cayley – Hamilton Theorem

<b>Unit – I</b>	<b>Partial Fraction and Binomial Series</b>	<b>09 Hours</b>
-----------------	---	-----------------

Partial Fraction - Resolution into partial fraction - Binomial theorem for a positive integral index - Binomial theorem for rational index Simple problems. Chapter-1 and 2

<b>Unit – II</b>	<b>Exponential Series and Logarithms Series</b>	<b>09 Hours</b>
------------------	---	-----------------

Exponential series - Standard result for exponential series Logarithms Series - Simple problems. Chapter-3 and 4

<b>Unit - III</b>	<b>Matrices</b>	<b>09 Hours</b>
-------------------	-----------------	-----------------

Introduction - Type of matrix - Matrix Operations - Transpose of a matrix - Determinant of a matrix - Inverse of a matrix - symmetric and skew symmetric - Conjugate of a matrix -Hermitian and skew Hermitian matrix - Simple problems Chapter-5 (Page No:5.1 to 5.17)

<b>Unit - IV</b>	<b>Rank of a Matrix</b>	<b>09 Hours</b>
------------------	-------------------------	-----------------

Orthogonal and Unitary matrix – Rank of a matrix- Test for consistency of linear equation - Condition for consistency Chapter-5 (Page No:5.18 to 5.49)

<b>Unit – V</b>	<b>Cayley Hamilton Theorem</b>	<b>09 Hours</b>
-----------------	--------------------------------	-----------------

Definition of Characteristic equation of a matrix – Characteristic roots of a matrix - Eigen values and the Corresponding Eigen vectors of matrix – Cayley Hamilton theorem (Statement only) – Verifications of Cayley Hamilton Theorem – Problems only. (Chapter 5) (Page No:5.50- 5.74)

**Text Book(s):**

1. Dr. P.R. Vittal, Allied Mathematics, Margham publication, Chennai– 17, Reprint 2016.

**Reference Books:**

1. S.G Venkatachalapathi, Allied Mathematics, Margham publication, Chennai – 17, Reprint 2011.
2. P. Kandasamy, K. Thilagavathy, Allied Mathematics Volume I, S. Chand publication, July 2012

**Web Resources:**

1. <https://www.mooc-list.com/tags/linear-algebra>
2. [https://onlinecourses.nptel.ac.in/noc22\\_ma45/preview](https://onlinecourses.nptel.ac.in/noc22_ma45/preview)

**Teaching Methodology:** Videos, Audios, PPT, Role Play, Field Visit, Seminar, Chalk & Talk, Lecturing, Case Study, Demonstration, Problem Solving, Group Discussion, Flipped Learning

**Learning Outcomes:**

Upon successful completion of this course, the student will be able to

COs	Statements	Bloom's Level
CO1	Define Partial Fraction and Binomial Series and examples.	K1
CO2	Define Exponential Series and Logarithms Series and examples.	K2
CO3	Define matrix and simple problems.	K3
CO4	Define Rank of matrix and problems.	K4
CO5	Describe Cayley Hamiltan Theorem.	K5

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

**Mapping (COs vs POs)**

	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	S	S
CO2	M	S	M	S	S
CO3	S	S	M	S	S
CO4	M	S	M	M	S
CO5	M	S	M	S	S

S - Strong, M – Medium, L – Low

<b>Semester: II</b>	<b>Course Code: 23UMACT03</b>	<b>Hours/Week: 4</b>	<b>Credit: 4</b>
<b>COURSE TITLE : CORE III - ANALYTICAL GEOMETRY (TWO &amp; THREE DIMENSIONS)</b>			

**Course Overview:**

1. This is a beginning course in plane analytic geometry emphasizing the correspondence between geometric curves and algebraic equations
2. This correspondence makes it possible to reformulate problems in geometry as equivalent problems in algebra, and vice versa.
3. Curves studied include straight lines, circles, parabolas, ellipses, and hyperbolas.
4. Coordinate transformations, polar coordinates, and parametric equations are also studied. The course assumes a sound background in algebra, geometry, and trigonometry.

**Learning Objectives:**

1. Necessary skills to analyze characteristics and properties of two- and three-dimensional geometric shapes.
2. To present mathematical arguments about geometric relationships
3. To solve real world problems on geometry and its applications.

<b>Unit - I</b>	<b>Pole, Polar</b>	<b>09 Hours</b>
-----------------	--------------------	-----------------

Pole, Polar - conjugate points and conjugate lines – diameters – conjugate diameters of an ellipse - semi diameters - conjugatediameters of hyperbola. (Book1: Chapter9, 10)

<b>Unit - II</b>	<b>Polar coordinates</b>	<b>09 Hours</b>
------------------	--------------------------	-----------------

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. (Book2: Chapter9)

<b>Unit - III</b>	<b>System of Planes</b>	<b>09 Hours</b>
-------------------	-------------------------	-----------------

System of Planes - Length of the perpendicular – Orthogonal projection. (Book3: Chapter2: Sections 2.5,2.7,2.9)

<b>Unit - IV</b>	<b>Representation of line</b>	<b>09 Hours</b>
------------------	-------------------------------	-----------------

Representation of line – angle between a line and a plane – co – planar lines – shortest distance between two skew lines – length of the perpendicular – intersection of three planes. (Book3: Chapter3:Sections 3.1, 3.2, 3.4, 3.6, 3.7, 3.8)

<b>Unit – V</b>	<b>Equation of a sphere</b>	<b>09 Hours</b>
-----------------	-----------------------------	-----------------

Equation of a sphere - general equation - section of a sphere by a plane - equation of the circle - tangent plane - angle of intersection of two spheres - condition for the orthogonality - radical plane. (Book3: Chapter6:Sections 6.1, 6.2, 6.3, 6.4, 6.6, 6.7, 6.8)

**Text Book(s):**

1. Vittal P.R. and Malini V, Algebra, Analytical Geometry & Trigonometry, Margam Publications, India.2018.
2. Manicavachagom Pillay T. K.and Natarajan T, A Text book of Analytical Geometry Part I- Two Dimensions, Divya Subramanian for Ananda Book Depot. 1996.
3. Shanti Narayan and Mittal P.K., Analytical Solid Geometry, S Chand Publishing, 2021.

**Reference Books:**

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

**Web Resources:**

1. <https://www.mooc-list.com/tags/analytical-geometry>
2. <https://archive.nptel.ac.in/course.html>
3. [https://onlinecourses.swayam2.ac.in/nce20\\_sc08/preview](https://onlinecourses.swayam2.ac.in/nce20_sc08/preview)
4. <https://www.coursera.org/lecture/fe-exam/analytic-geometry-and-trigonometry-straight-lines-SV8UL>

<p><b>Teaching Methodology:</b> Videos, Audios, PPT, Role Play, Field Visit, Seminar, Chalk &amp; Talk, Lecturing, Case Study, Demonstration, Problem Solving, Group Discussion, Flipped Learning</p>
---

**Learning Outcomes:**

Upon successful completion of this course, the student will be able to

COs	Statements	Bloom's Level
CO1	Find pole, polar for conics, diameters, conjugate diameters for ellipse and hyperbola	K1
CO2	Find the polar equations of straight line and circle, equations of chord, tangent and normal and to find the asymptotes of hyperbola	K2
CO3	Explain in detail the system of Planes	K3
CO4	Explain in detail the system of Straight lines	K4
CO5	Explain in detail the system of Spheres	K5

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

**Mapping (COs vs POs)**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
<b>CO1</b>	L	M	M	L	-	-	S	M	L
<b>CO2</b>	M	M	M	L	-	-	S	M	L
<b>CO3</b>	M	M	M	L	-	-	S	M	L
<b>CO4</b>	M	M	S	L	-	-	S	M	L
<b>CO5</b>	M	M	S	L	-	-	S	M	L

**S - Strong, M – Medium, L - Low**

<b>Semester: II</b>	<b>Course Code: 23UMACT04</b>	<b>Hours/Week: 4</b>	<b>Credit: 4</b>
<b>COURSE TITLE : CORE IV - INTEGRAL CALCULUS</b>			

**Course Overview:**

1. Integral calculus helps in finding the anti-derivatives of a function.
2. These anti-derivatives are also called the integrals of the function.
3. The process of finding the anti-derivative of a function is called integration.

**Learning Objectives:**

1. Knowledge on integration and its geometrical applications, double, triple integrals and improper integrals.
2. Knowledge about Beta and Gamma functions and their applications.
3. Skills to Determine Fourier series expansions.

<b>Unit - I</b>	<b>Reduction formulae</b>	<b>09 Hours</b>
-----------------	---------------------------	-----------------

Reduction formulae - Types, integration of product of powers of algebraic and trigonometric functions, integration of product of powers of algebraic and logarithmic functions - Bernoulli's formula. (Chapter1: Sections 13 and 14)

<b>Unit - II</b>	<b>Multiple Integrals</b>	<b>09 Hours</b>
------------------	---------------------------	-----------------

Multiple Integrals - definition of double integrals - evaluation of double integrals – double integrals in polar coordinates - Change of order of integration. (Chapter5: Sections 1, 2.1, 2.2 and 3.1)

<b>Unit - III</b>	<b>Triple integrals</b>	<b>09 Hours</b>
-------------------	-------------------------	-----------------

Triple integrals – applications of multiple integrals - volumes of solids of revolution - areas of curved surfaces – change of variables - Jacobian. (Chapter5: Sections 4, 5.1, 5.2, 5.3, 6.1,7 and Chapter6: 1.1,1.2)

<b>Unit - IV</b>	<b>Beta and Gamma function</b>	<b>09 Hours</b>
------------------	--------------------------------	-----------------

Beta and Gamma functions – infinite integral – definitions – recurrence formula of Gamma functions – properties of Beta and Gamma functions - relation between Beta and Gamma functions - Applications. (Chapter7: Sections 2.1,2.2,2.3, 3, 4, and 6.)



<b>Unit - V</b>	<b>Geometric Applications of Integration</b>	<b>09 Hours</b>
-----------------	--	-----------------

Geometric Applications of Integration – Areas under plane curves: Cartesian coordinates - Area of a closed curve – Areas in polar coordinates - Trapezoidal rule – Simpson’s rule and Physical Applications of Integral calculus – Centroid – Centre of mass of an arc - Centre of mass of a plane area - Centroid of a solid of revolution – Centroid of a surface of revolution . (Chapter2: Sections 1.1 to 1.4 , 2.1,2.2 and Chapter3: 1.1 to 1.5 Simple Applications)

**Text Book(s):**

1. Narayanan S and Manicavachagom Pillay T.K. Calculus-Volume II, (2006), S. Viswananthan Printers Pvt. Ltd.

**Reference Books:**

1. Narayanan S and Manicavachagom Pillay T.K. Calculus-VolumeII, (2006), S. Viswananthan Printers Pvt. Ltd.
1. H. Anton, I. Birens and S. Davis, Calculus, John Wiley and Sons, Inc., 2002.
2. G.B. Thomas and R.L. Finney, Calculus, Pearson Education, 2007.

**Web Resources:**

1. <https://archive.nptel.ac.in/courses/111/105/111105122/>
2. [https://onlinecourses.swayam2.ac.in/cec24\\_ma10/preview](https://onlinecourses.swayam2.ac.in/cec24_ma10/preview)
3. <https://www.my-mooc.com/en/categorie/calculus>

**Teaching Methodology:** Videos, Audios, PPT, Role Play, Field Visit, Seminar, Chalk & Talk, Lecturing, Case Study, Demonstration, Problem Solving, Group Discussion, Flipped Learning

**Learning Outcomes:**

Upon successful completion of this course, the student will be able to

COs	Statements	Bloom's Level
CO1	Determine the integrals of algebraic, trigonometric and logarithmic functions and to find the reduction formulae	K1
CO2	Evaluate double and triple integrals and problems using change of order of integration	K2
CO3	Solve multiple integrals and to find the areas of curved surfaces and volumes of solids of revolution	K3
CO4	Explain beta and gamma functions and to use them in solving problems of integration	K4
CO5	Explain Geometric and Physical applications of integral calculus	K5
K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create		

Mapping (COs vs POs)									
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	S	M	S	-	-	S	S	M	L
CO2	S	L	S	-	-	-	S	M	L
CO3	S	L	S	-	-	-	S	M	L
CO4	S	M	S	-	-	-	S	M	L
CO5	S	M	S	-	M	L	S	M	L

S - Strong, M – Medium, L – Low

<b>Semester: II</b>	<b>Course Code: 23UMASE03</b>	<b>Hours/Week: 2</b>	<b>Credit: 2</b>
<b>COURSE TITLE : SKILL ENHANCEMENT COURSES III - COMPUTATIONAL MATHEMATICS</b>			

#### Course Overview:

1. Computational Math is a specialized field that combines mathematical theory, practical engineering, and computer science. By studying a Computational Mathematics degree you will learn how to solve complex problems in science, engineering, and business, by using mathematical models and computational algorithms.

#### Learning Objectives:

1. Understand and use the structure of C++ programme, to solve different Numerical Methods.

<b>Unit - I</b>	<b>Algebraic and Transcendental Equations</b>	<b>09 Hours</b>
-----------------	---	-----------------

Algebraic and Transcendental Equations: Bisection method - Method of false position - Method of successive approximation – Newton - Raphson's method - Secant Method - Graeff's root squaring method.

<b>Unit - II</b>	<b>System of Linear Algebraic Equations</b>	<b>09 Hours</b>
------------------	---	-----------------

System of Linear Algebraic Equations: Direct method - Iterative method - Eigen value problems.

<b>Unit - III</b>	<b>C++ Program for Bisection method</b>	<b>09 Hours</b>
-------------------	---	-----------------

C++ Program for Bisection method - C++ Program for Method of false position - C++ Program for Method of successive approximation - C++ Program for Newton - Raphson's method.

<b>Unit - IV</b>	<b>C++ Program for Secant Method</b>	<b>09 Hours</b>
------------------	--------------------------------------	-----------------

C++ Program for Secant Method - C++ Program for Graeff's root squaring method - C++ Program for Gauss elimination method - C++ Program for Gauss Jordan method.

<b>Unit - V</b>	<b>C++ Program for Jacobian method</b>	<b>09 Hours</b>
-----------------	--	-----------------

C++ Program for Jacobian method - C++ Program for Gauss Seidal method - C++ Program for Largest eigen value by power method

### Text Book(s):

1. R.M. Somasundaram and R.M. Chandrasekaran, "Numerical Methods with C++ Programming", Prentice Hall India Pvt. Ltd., New Delhi, 2005.

### Reference Books:

1. Pallab Ghosh, "Numerical Methods with Computer Programs in C++", Prentice Hall India Pvt. Ltd., New Delhi, 2009.
2. T. Veerarajan and T. Ramachandran, "Numerical Methods with Programs in C", Second Edition, McGraw Hill Education Pvt. Ltd, New Delhi, 2006.

### Web Resources:

1. [https://onlinecourses.nptel.ac.in/noc22\\_ma24/preview](https://onlinecourses.nptel.ac.in/noc22_ma24/preview)
2. <https://archive.nptel.ac.in/noc/courses/111/>
3. <https://www.mooc-list.com/tags/math>

**Teaching Methodology:** Videos, Audios, PPT, Role Play, Field Visit, Seminar, Chalk & Talk, Lecturing, Case Study, Demonstration, Problem Solving, Group Discussion, Flipped Learning

**Learning Outcomes:**

Upon successful completion of this course, the student will be able to

COs	Statements	Bloom's Level
CO1	Describe the roots of algebraic equations using different methods like, Newton - Raphson method, Secant Method etc.	K1
CO2	Solve system of algebraic equations using direct and iterative methods.	K2
CO3	To write C++ Program to compute roots of algebraic equations using Bisection method, Newton - Raphson method etc.	K3
CO4	To write C++ Program to compute roots of algebraic equations using Secant method, Gauss Jordan method etc.	K4
CO5	To write C++ Program to solve the system of algebraic equations using the Jacobian method, Gauss Seidal method.	K5

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

**Mapping (COs vs POs)**

	PO1	PO2	PO3	PO4	PO5
<b>CO1</b>	S	S	M	S	S
<b>CO2</b>	M	S	S	S	S
<b>CO3</b>	S	S	S	S	S
<b>CO4</b>	M	S	S	M	S
<b>CO5</b>	M	S	S	S	M

S - Strong, M – Medium, L - Low

<b>Semester: II</b>	<b>Course Code: 23UMAAT02</b>	<b>Hours/Week: 4</b>	<b>Credit: 4</b>
<b>COURSE TITLE : ALLIED MATHEMATICS II - DIFFERENTIAL EQUATIONS AND LAPLACE TRANSFORMS (FOR B. SC PHYSICS /B. SC CHEMISTRY)</b>			

**Course Overview:**

1. The course begins with an introduction of control theory and the application of Laplace transforms in solving differential equations, providing a strong foundation in linearity, time-invariance, and dynamic system

**Learning Objectives:**

1. Develop the basic concepts of Maxima and Minima of two variables and Numerical methods problems.
2. To learn the second order differential equation with constant coefficients.
3. To learn the basic concepts of Laplace Transforms, Inverse Laplace Transforms & Applications.

<b>Unit – I</b>	<b>Jacobian and Maxima &amp; minima</b>	<b>09 Hours</b>
-----------------	---	-----------------

Jacobian of two variables and three variables – Maxima and Minima functions of two variables – Problems only. (Chapter9: Sections 3 & 4 )

<b>Unit – II</b>	<b>Finite Differences</b>	<b>09 Hours</b>
------------------	---------------------------	-----------------

Finite difference – Higher differences – Construction of difference table – Interpolation of missing value – Newton’s Forward and Newton’s Backward difference formula (no proof) – Lagrange’s Interpolation formula (no proof) - simple problems only. (Chapter7)

<b>Unit - III</b>	<b>Second Order Differential Equations</b>	<b>09 Hours</b>
-------------------	--	-----------------

Second Order Differential Equation with constant coefficients – Complementary function – Particular Integral and Solution of the type :  $e^{ax}$ ,  $x^n$ ,  $\cos ax$  (or)  $\sin ax$ ,  $e^{asx} \cos bx$ ,  $e^{as} \sin bx$ ,  $e^{as} \cos bx$  – Problems only. (Chapter23)

<b>Unit - IV</b>	<b>Laplace Transforms</b>	<b>09 Hours</b>
------------------	---------------------------	-----------------

Definition of Laplace Transforms – Standard formula – Linearity property – shifting property – Change of Scale property – Laplace Transforms of derivatives – Problems. (Chapter27)

<b>Unit – V</b>	<b>Inverse Laplace Transforms</b>	<b>09 Hours</b>
-----------------	-----------------------------------	-----------------

Standard formula- Elementary theorems (no proof) – Applications to solutions of second order differential equations with constant coefficients – simple problems. (Chapter27)

**Text Book(s):**

1. Dr .P. R. Vittal, Allied Mathematics, Margham publication, Chennai – 17, Reprint 2016.

**Reference Books:**

1. S.G Venkatachalapathi, Allied Mathematics, Margham publication, Chennai – 17, Reprint 2011.
2. P. Kandasamy, K. Thilagavathy, Allied Mathematics Volume I, S. Chand publication, July 2012

**Web Resources:**

1. [https://onlinecourses.nptel.ac.in/noc22\\_ma62/preview](https://onlinecourses.nptel.ac.in/noc22_ma62/preview)
2. <https://www.mooc-list.com/tags/laplace-transform>

**Teaching Methodology:** Videos, Audios, PPT, Role Play, Field Visit, Seminar, Chalk & Talk, Lecturing, Case Study, Demonstration, Problem Solving, Group Discussion, Flipped Learning

**Learning Outcomes:**

Upon successful completion of this course, the student will be able to

COs	Statements	Bloom's Level
CO1	Explain Jacobian of two variables and three variables and Maxima and Minima functions of two variables.	K1
CO2	Explain Finite difference and Higher differences and Construction of difference table and Newton's Forward Backward difference formula and Lagrange's Interpolation formula.	K2
CO3	Explain Second Order Differential Equation with constant coefficients and Particular Integral	K3
CO4	Explain definition of Laplace Transforms and standard formula and linearity property and shifting property and Change of Scale property and Laplace Transforms of derivatives	K4
CO5	Explain standard formula and elementary theorems and Applications to solutions of second order differential equations with constant coefficients.	K5
K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create		

**Mapping (COs vs POs)**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	S	M	S	-	-	-	S	M	M
CO2	M	L	S	L	-	-	S	M	L
CO3	S	L	S	L	-	-	S	M	L
CO4	S	L	S	-	-	-	S	M	L
CO5	S	L	S	-	-	-	S	M	L

S - Strong, M – Medium, L – Low

<b>Semester: II</b>	<b>Course Code: 23UMAAP01</b>	<b>Hours/Week: 2</b>	<b>Credit: 2</b>
<b>COURSE TITLE: ALLIED MATHEMATICS – PRACTICAL I (FOR B. SC PHYSICS /B. SC CHEMISTRY)</b>			

**Course Overview:**

1. This course is designed for the students to expose the topics such as expansions of trigonometric functions, partial differential equations, vector differentiation, and integration.

**Learning Objectives:**

1. Acquire knowledge about Matrices and Cayley – Hamilton Theorem.
2. Understand the concepts of differentiation and Vector point function

<b>Unit – I</b>	<b>Matrices</b>	<b>09 Hours</b>
-----------------	-----------------	-----------------

Rank of Matrix – Problems up to (3x3) Matrix – Characteristics equation of a Matrix – Cayley Hamilton Theorem (statement only) – Problems to verify Cayley Hamilton Theorem. (Chapter 5)

<b>Unit – II</b>	<b>Leibnitz formula for n<sup>th</sup> derivative</b>	<b>09 Hours</b>
------------------	---	-----------------

Leibnitz formula (without proof) for nth derivative – Problems. (Page no: 8.23 to 8.39 of the Text book)(Chapter 8)

<b>Unit - III</b>	<b>Partial Differentiation</b>	<b>09 Hours</b>
-------------------	--------------------------------	-----------------

Euler 's theorem on homogeneous function (without proof) – Problems to verify Euler's Theorem – Partial derivative – problems ( Page no. 9.1 to 9.13 and 9.18 to 9.27 of the Text Book)(Chapter 9)

<b>Unit - IV</b>	<b>Vector Differentiation</b>	<b>09 Hours</b>
------------------	-------------------------------	-----------------

Scalar and Vector point functions – Gradient of scalar point functions – Problems only. (Chapter 28)

<b>Unit – V</b>	<b>Divergence and Curl of Vector point functions :</b>	<b>09 Hours</b>
-----------------	--	-----------------

Divergence and Curl of vector point functions – Solinoidal vector – Irrotational vector – Problems only. ( Chapter 28)

**Text Book(s):**

1. Dr. P. R. Vittal, Allied Mathematics , Margham publication, Chennai – 17, Reprint 2016

**Reference Books:**

1. S.G Venkatachalapathi, Allied Mathematics, Margham publication, Chennai – 17, Reprint 2011.
2. P. Kandasamy, K. Thilagavathy, Allied Mathematics Volume I, S. Chand publication, July 2012

**Web Resources:**

1. <https://onlinecourses.nptel.ac.in/>
2. <https://www.mooc.org/>

**Teaching Methodology:** Videos, Audios, PPT, Role Play, Field Visit, Seminar, Chalk & Talk, Lecturing, Case Study, Demonstration, Problem Solving, Group Discussion, Flipped Learning

**Learning Outcomes:**

Upon successful completion of this course, the student will be able to

COs	Statements	Bloom's Level
CO1	Explain in detail about Rank of Matrix and Characteristic equation of a Matrix and Cayley Hamilton Theorem and Problems to verify Cayley Hamilton .	K1
CO2	Explain Leibnitz formula for nth derivative	K2
CO3	Explain Euler's theorem on homogeneous function and Problems to verify Euler's Theorem and Partial derivative.	K3
CO4	Explain Scalar and Vector point functions and Gradient of scalar point functions	K4
CO5	Explain Divergence and Curl of vector point functions and Solinoidal vector and Irrotational vector.	K5
K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create		

**Mapping (COs vs POs)**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	S	L	M	-	-	-	S	M	L
CO2	M	L	M	L	-	-	S	M	L
CO3	S	L	M	L	-	-	S	M	L
CO4	S	L	M	-	-	-	S	M	L
CO5	S	L	M	-	-	-	S	M	L

**S - Strong, M – Medium, L – Low**



<b>Semester: II</b>	<b>Course Code: 23UMAEGS04</b>	<b>Hours/Week: 5</b>	<b>Credit: 3</b>
<b>COURSE TITLE : ELECTIVE COURSE GENERIC SPECIFIC EC II - OPTIMIZATION TECHNIQUES (FOR ALL COMPUTER SCIENCE DEPARTMENTS)</b>			

**Course Overview:**

1. The purpose of this course is to develop knowledge in the field of optimization techniques their basic concepts, principles. linear programming and queuing theory

**Learning Objectives:**

1. To know the concepts of Mathematical formulation and solving L.P.P
2. To find the solutions of Transportation and Assignment models.  
To teach the techniques for converting the real life problems as Mathematical problems
3. and solving them.

<b>Unit – I</b>	<b>Linear Programming Formulation and Graphical Method</b>	<b>09 Hours</b>
-----------------	--	-----------------

Introduction - Requirements for employing LPP technique – Mathematical Formulation of L.P.P. - Basic assumptions - Graphical method of the Solution of a L.P.P. – Some more cases – Advantage of Linear Programming – Limitations of Linear Programming. Chapter 2 ( Sections 2.1 – 2.8 )

<b>Unit – II</b>	<b>Transportation Model</b>	<b>09 Hours</b>
------------------	-----------------------------	-----------------

Introduction - Mathematical formulation of a transportation problem - Methods for finding initial basic feasible solution – Transportation algorithm or MODI method – Degeneracy in Transportation problems – Unbalanced Transportation Problems – Maximization case in Transportation problems. Chapter 7  
( Sections 7.1 – 7.5 )

<b>Unit - III</b>	<b>Assignment Problem</b>	<b>09 Hours</b>
-------------------	---------------------------	-----------------

Introduction – Mathematical formulation of an Assignment Problem – Difference between the Transportation Problem and Assignment Problem – Assignment Algorithm or Hungarian Method – Unbalanced Assignment Models – Maximization case in Assignment Problems. Chapter 8 ( Sections 8.1 – 8.2, 8.4 - 8.7 )

<b>Unit - IV</b>	<b>Sequencing Problems</b>	<b>09 Hours</b>
------------------	----------------------------	-----------------

Introduction – Assumptions of solving a sequencing Problem - Definition - Procedure for finding Optimum Sequence (n jobs on 2 machines) – Processing n jobs on three machines – Processing n jobs on m machines. Chapter 14 ( Sections 14.1 – 14.6 ).

<b>Unit – V</b>	<b>Scheduling by PERT and CPM:</b>	<b>09 Hours</b>
-----------------	------------------------------------	-----------------

Introduction – Basic Terminologies – Rules for constructing a project network – Network computations – Floats – Programme Evaluation Review Technique (PERT) – Basic differences between PERT and CPM. Chapter 15 ( Sections 15.1 – 15.7 )

**Text Book(s):**

1. Sundaresan, V., Ganapathy Subramanian, K.S. and Ganesan, K. Resource Management Techniques. [Seventh Edition]. AR Publication, Chennai.2013

**Reference Books:**

1. Kantiswarup., Gupta, P.K. and Man Mohan. Operations Research.[Seventeenth Edition]. Sultan Chand and Sons, New Delhi. 2020. 2. Gupta, P.K
2. Gupta, P.K. and Hira, D.S. Operations Research. [Eighth Edition].

**Web Resources:**

1. [https://onlinecourses.nptel.ac.in/noc21\\_me10/preview](https://onlinecourses.nptel.ac.in/noc21_me10/preview)
2. <https://www.mooc-list.com/tags/optimization>

**Teaching Methodology:** Videos, Audios, PPT, Role Play, Field Visit, Seminar, Chalk & Talk, Lecturing, Case Study, Demonstration, Problem Solving, Group Discussion, Flipped Learning

**Learning Outcomes:**

Upon successful completion of this course, the student will be able to

COs	Statements	Bloom's Level
CO1	Formulate and solve real life problems through L.P.P	K1
CO2	Compute the optimum Transportation schedule.	K2
CO3	Find the optimum Assignment model.	K3
CO4	Solve Sequencing problems	K4
CO5	Use the techniques for planning and scheduling of projects.	K5

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

<b>Mapping (COs vs POs)</b>									
	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>
<b>CO1</b>	M	S	S	M	L	S	M	S	S
<b>CO2</b>	M	S	S	M	L	S	M	S	S
<b>CO3</b>	M	S	S	M	L	S	M	S	S
<b>CO4</b>	M	S	S	M	L	S	M	S	S
<b>CO5</b>	M	S	S	M	L	S	M	S	S

**S - Strong, M – Medium, L – Low**

<b>Semester: II</b>	<b>Course Code: 23UMAGSP03</b>	<b>Hours/Week: 2</b>	<b>Credit: 2</b>
<b>COURSE TITLE: OPTIMIZATION TECHNIQUES - PRACTICAL</b>			

#### **Course Overview:**

1. This course is to develop knowledge in the field of optimization techniques their basic concepts, principles. Linear programming and queuing theory.

#### **Learning Objectives:**

1. Acquire knowledge about LPP and graphical method.
2. Understanding the concepts of Rules for constructing a project network.

<b>Unit - I</b>	<b>Linear Programming</b>	<b>09 Hours</b>
-----------------	---------------------------	-----------------

Linear programming problem – Graphical Method

<b>Unit - II</b>	<b>Transportation</b>	<b>09 Hours</b>
------------------	-----------------------	-----------------

Transportation Problem - Finding initial basic feasible solution only by using North - West Corner Rule, Least cost Method - Vogel's Approximation Method.

<b>Unit - III</b>	<b>Assignment problem</b>	<b>09 Hours</b>
-------------------	---------------------------	-----------------

Assignment Problem - Finding optimal solution by using Hungarian Method.

<b>Unit - IV</b>	<b>Sequencing problem</b>	<b>09 Hours</b>
------------------	---------------------------	-----------------

Sequencing problem - N jobs to be operated on Two Machines.

<b>Unit - V</b>	<b>Network</b>	<b>09 Hours</b>
-----------------	----------------	-----------------

Network - Rules for constructing a project network - Floats.

**Text Book(s):**

1. Sundaresan, V. Ganapathy Subramanian K.S. and Ganesan. K, Resource Management Techniques [Seventh Edition], AR Publication, Chennai, 2013.

**Reference Books:**

1. Kaniswarup, Gupta. P.K. and Man Mobhan, Operations Research [Seventeenth Edition], Sultan Chand and Sons. New Delhi, 2020.
2. Gupta. P.K and Hira, D.S. Operations Research [Eight Edition], Sultan Chand and Sons, New Delhi, 2020.
3. Kalabathy. S. Operation Research [Fourth Edition], Vikas Publishing House, Chennai, 2012.

**Web Resources:**

1. <https://nptel.ac.in>

**Teaching Methodology:** Videos, Audios, PPT, Role Play, Field Visit, Seminar, Chalk & Talk, Lecturing, Case Study, Demonstration, Problem Solving, Group Discussion, Flipped Learning

**Learning Outcomes:**

Upon successful completion of this course, the student will be able to

COs	Statements	Bloom's Level
CO1	Formulate and solve real life problems through L.P.P.	K1
CO2	Compute the optimum Transportation schedule	K2
CO3	Find the optimum Assignment model.	K3
CO4	Solve Sequencing problems..	K4
CO5	Use the techniques for planning and scheduling of projects	K5
K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create		

Mapping (COs vs POs)										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10
CO1	M	S	S	M	L	S	M	M	M	M
CO2	M	S	S	M	L	S	M	M	M	M
CO3	M	S	S	M	L	S	M	M	M	M
CO4	M	S	S	M	L	S	M	M	M	M
CO5	M	S	S	M	L	S	M	M	M	M

S - Strong, M – Medium, L – Low

<b>Semester: III</b>	<b>Course Code: 23UMACT05</b>	<b>Hours/Week: 5</b>	<b>Credit: 4</b>
<b>COURSE TITLE : CORE V - VECTOR CALCULUS AND ITS APPLICATIONS</b>			

#### Course Overview:

1. Vector calculus studies the relationship between vectors and the properties of line integrals and surface integrals. The following are some of the properties of vectors as used in vector calculus: Vectors have magnitude and direction. Vectors can be one, two, or three-dimensional.

#### Learning Objectives:

1. Knowledge about differentiation of vectors and on differential operators. Knowledge about derivatives of vector functions.
2. Skills in evaluating line, surface and volume integrals.  
The ability to analyze the physical applications of derivatives of vectors.

<b>Unit - I</b>	<b>Vector point function</b>	<b>09 Hours</b>
-----------------	------------------------------	-----------------

Vector point function - Scalar point function - Derivative of a vector and derivative of a sum of vectors - Derivative of a product of a scalar and a vector point function - Derivative of a scalar product and vector product. (Chapter1: Sections 1.1 to 1.5)

<b>Unit - II</b>	<b>The vector operator</b>	<b>09 Hours</b>
------------------	----------------------------	-----------------

The vector operator 'del', The gradient of a scalar point function - Divergence of a vector - Curl of a vector - solenoidal and irrotational vectors – simple applications. (Chapter2: Sections 2.1 to 2.7.)

<b>Unit - III</b>	<b>Laplacian operator</b>	<b>09 Hours</b>
-------------------	---------------------------	-----------------

Laplacian operator, Vector identities - Line integral - simple problems. Chapter2: Sections 2.8 and Chapter3: 3.1, 3.2, 3.3, 3.4)

<b>Unit - IV</b>	<b>Surface integral</b>	<b>09 Hours</b>
------------------	-------------------------	-----------------

Surface integral - Volume integral – Applications. (Chapter3: 3.5, 3.6)

<b>Unit - V</b>	<b>Gauss divergence Theorem</b>	<b>09 Hours</b>
-----------------	---------------------------------	-----------------

Gauss divergence Theorem, Stoke's Theorem, Green's Theorem in two dimensions Applications to real life situations. (Chapter4: 4.1 to 4.5)

#### Text Book(s):

1. Duraipandian, P and Laxmiduraipandian – Vector Analysis(Revised Edition - Reprint 2005) Emerald Publishers.

#### Reference Books:

1. J.C. Susan, Vector Calculus,, (4th Edn.) Pearson Education,Boston, 2012..

#### Web Resources:

1. <https://www.mooc-list.com/tags/vector-calculus>
2. [https://onlinecourses.nptel.ac.in/noc20\\_ma07/preview](https://onlinecourses.nptel.ac.in/noc20_ma07/preview)

**Teaching Methodology:** Videos, Audios, PPT, Role Play, Field Visit, Seminar, Chalk & Talk, Lecturing, Case Study, Demonstration, Problem Solving, Group Discussion, Flipped Learning

**Learning Outcomes:**

Upon successful completion of this course, the student will be able to

COs	Statements	Bloom's Level
CO1	Find the derivative of vector and sum of vectors, product of scalar and vector point function and to Determine derivatives of scalar and vector products	K1
CO2	Applications of the operator 'del' and to Explain solenoidal and ir-rotational vectors	K2
CO3	Solve simple line integrals	K3
CO4	Solve surface integrals and volume integrals	K4
CO5	Verify the theorems of Gauss, Stoke's and Green's(Two Dimension)	K5

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

**Mapping (COs vs POs)**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	S	M	S	L	-	-	S	M	L
CO2	S	M	S	L	M	-	S	M	L
CO3	S	S	S	S	-	-	S	S	L
CO4	S	S	S	S	-	-	S	S	L
CO5	S	S	S	S	M	-	S	S	L

**S - Strong, M – Medium, L – Low**

<b>Semester: III</b>	<b>Course Code: 23UMACT06</b>	<b>Hours/Week: 4</b>	<b>Credit: 4</b>
<b>COURSE TITLE : CORE VI - DIFFERENTIAL EQUATIONS AND ITS APPLICATIONS</b>			

**Course Overview:**

1. In Mathematics, a differential equation is an equation that contains one or more functions with its derivatives. The derivatives of the function define the rate of change of a function at a point. It is mainly used in fields such as MATHEMATICS, engineering, biology and so on. The primary purpose of the differential equation is the study of solutions that satisfy the equations and the properties of the solutions.

**Learning Objectives:**

1. Knowledge about the methods of solving Ordinary and Partial Differential Equations.  
The understanding of how Differential Equations can be used as a
2. Powerful tool in solving problems in science.

<b>Unit - I</b>	<b>Ordinary Differential Equations</b>	<b>09 Hours</b>
-----------------	--	-----------------

Ordinary Differential Equations: Variable separable - Homogeneous Equation – Non - Homogeneous Equations of first degree in two variables - Linear Equation - Bernoulli's Equation - Exact differential equations. (Chapter2: Sections 1 to 6)

<b>Unit - II</b>	<b>Equation of first order but of higher degree</b>	<b>09 Hours</b>
------------------	---	-----------------

Equation of first order but of higher degree: Equation solvable for  $dy/dx$  - Equation solvable for  $y$  - Equation solvable for  $x$  - Clairaut's form - Linear Equations with constant coefficients - Particular integrals of algebraic, exponential, trigonometric functions and their products.

(Chapter4: Sections 1,2 ,3 and Chapter5: 1 to 4)

<b>Unit - III</b>	<b>Simultaneous linear differential equations</b>	<b>09 Hours</b>
-------------------	---	-----------------

Simultaneous linear differential equations - Linear Equations of the Second Order - Complete solution in terms of known integrals - Reduction to the Normal form - Change of the Independent Variable - Method of Variation of Parameters. (Chapter6 and Chapter 8: Sections 1 to 4)

<b>Unit - IV</b>	<b>Partial differential equation</b>	<b>09 Hours</b>
------------------	--------------------------------------	-----------------

Partial differential equation Formation of PDE by Eliminating arbitrary constants and arbitrary functions - complete integral - singular integral-General integral - Lagrange's Linear



Equations – Simple Applications. (Chapter12: 1,2,3, and 4)

<b>Unit - V</b>	<b>Special methods</b>	<b>09 Hours</b>
-----------------	------------------------	-----------------

Special methods – Standard forms - Charpit's Methods - Simple Applications (Chapter12: 5, and 6)

**Text Book(s):**

1. Narayanan S and Manicavachagom Pillay T.K. Differential
2. equations and its application, 2006, S. Viswanathan Printers Pvt. Ltd.

**Reference Books:**

1. Shepley L. Ross, Differential Equations, 3rd Ed., John Wiley and Sons, 1984.

**Web Resources:**

1. [https://onlinecourses.nptel.ac.in/noc24\\_ma37/preview](https://onlinecourses.nptel.ac.in/noc24_ma37/preview)
2. [https://onlinecourses.swayam2.ac.in/cec22\\_ma10/preview](https://onlinecourses.swayam2.ac.in/cec22_ma10/preview)

**Teaching Methodology:** Videos, Audios, PPT, Role Play, Field Visit, Seminar, Chalk & Talk, Lecturing, Case Study, Demonstration, Problem Solving, Group Discussion, Flipped Learning

**Learning Outcomes:**

Upon successful completion of this course, the student will be able to

COs	Statements	Bloom's Level
CO1	Determine solutions of homogeneous equations, non-homogeneous equations of degree one in two variables, solve Bernoulli's equations and exact differential equations	K1
CO2	Find the solutions of equations of first order but not of higher degree and to Determine particular integrals of algebraic, exponential, trigonometric functions and their products	K2
CO3	Find solutions of simultaneous linear differential equations, linear equations of second order and to find solutions using the method of variations of parameters	K3
CO4	Form a PDE by eliminating arbitrary constants and arbitrary functions, find complete, singular and general integrals, to solve Lagrange's equations	K4
CO5	Explain standard forms and Solve Differential equations using Charpit's method	K5
K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create		

Mapping (COs vs POs)									
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	S	M	S	S	L	S	S	M	M
CO2	S	L	S	M	L	-	S	M	L
CO3	S	L	S	M	L	-	S	S	L
CO4	S	L	S	M	M	L	S	S	L
CO5	S	L	S	M	M	L	S	S	L

S - Strong, M – Medium, L – Low

<b>Semester: III</b>	<b>Course Code: 23UMASE04</b>	<b>Hours/Week: 1</b>	<b>Credit: 1</b>
<b>COURSE TITLE : SKILL ENHANCEMENT COURSES IV - STATISTICS WITH EXCEL PROGRAMMING</b>			

#### Course Overview:

- Learn all about Descriptive and Inferential Statistics with practical examples

#### Learning Objectives:

- Acquire the knowledge of Statistics with Excel Programming
- Differentiate statistical nomenclature when calculating variance.

<b>Unit - I</b>	<b>Distribution of data</b>	<b>09 Hours</b>
-----------------	-----------------------------	-----------------

Characteristics of data- Frequency distribution - Procedure for Constructing a Frequency Distribution - Using Excel to Construct a Frequency Distribution - Relative Frequency Distribution - Cumulative Frequency Distribution. (Chapter-2: Pages 58 to 70)

<b>Unit - II</b>	<b>Histograms</b>	<b>09 Hours</b>
------------------	-------------------	-----------------

Relative Frequency Histogram-Normal Distribution-Common Distribution Shapes – Skewness - Using XLSTAT for Histograms - Graphs-Using Excel to Construct a Scatterplot - Correlation Coefficient. (Chapter-2: Pages 70 to 81)

<b>Unit - III</b>	<b>Time-Series</b>	<b>09 Hours</b>
-------------------	--------------------	-----------------

Group – Dotplots - Using XLSTAT for Stem plots - Bar Graphs - Using Excel to Create Bar

Graphs - Pareto Charts - Pie Charts - Using Excel to Create Pie Charts - Frequency Polygon - Using Excel to Create Frequency Polygons. (Chapter-2: Pages 81 to 98)

<b>Unit - IV</b>	<b>Descriptive statistics</b>	<b>09 Hours</b>
------------------	-------------------------------	-----------------

Measures of Center – Mean - Using Excel to Calculate the Mean – Median - Using Excel to Find the Median. (Chapter-3: Pages 110 to 114)

<b>Unit - V</b>	<b>Mode</b>	<b>09 Hours</b>
-----------------	-------------	-----------------

Using Excel to Find the Mode – Midrange - Using Excel to Calculate the Midrange - Weighted Mean - Using Excel for Descriptive Statistics. (Chapter-3: Pages 114 to 125)

**Text Book(s):**

1. Mario F. Triola, “Elementary Statistics Using Excel”, Fifth Edition, Pearson New International Edition, 2014. (Chapter 2 and 3).

**Reference Books:**

1. E. Balagurusamy, “Computer Oriented Statistical and Numerical Methods”, Macmillan Publishers India Limited, 2000.

**Web Resources:**

1. <https://www.coursera.org/learn/excel-data-analysis>
2. [https://onlinecourses.nptel.ac.in/noc21\\_ge21/preview](https://onlinecourses.nptel.ac.in/noc21_ge21/preview)

**Teaching Methodology:** Videos, Audios, PPT, Role Play, Field Visit, Seminar, Chalk & Talk, Lecturing, Case Study, Demonstration, Problem Solving, Group Discussion, Flipped Learning

**Learning Outcomes:**

Upon successful completion of this course, the student will be able to

<b>COs</b>	<b>Statements</b>	<b>Bloom’s Level</b>
CO1	Handle distribution of data and analyses the characteristics of data using Excel.	K1
CO2	To find Normal distribution, common distribution shapes, Correlatio Coefficient and plot graphs using Excel.	K2
CO3	Create Time-Series Graphs, Dot plots, Stem plots, Bar Charts, Pie Charts using Excel.	K3
CO4	Compute Mean and Median using Excel.	K4
CO5	Compute Mode, Midrange, Weighted Mean using Excel.	K5
K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create		

Mapping (COs vs POs)									
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	M	M	S	S	L	S	S	M	M
CO2	M	L	S	L	S	-	S	M	L
CO3	M	L	S	L	S	-	S	S	L
CO4	M	L	S	M	M	L	S	S	L
CO5	M	L	S	M	M	L	S	S	L

S - Strong, M – Medium, L – Low

<b>Semester: III</b>	<b>Course Code: 23UMASE05</b>	<b>Hours/Week: 2</b>	<b>Credit: 2</b>
<b>COURSE TITLE : SKILL ENHANCEMENT COURSE V - MATHEMATICS FOR COMPETITIVE EXAMINATION – III</b>			

#### Course Overview:

- The main purpose of adding the category of Quantitative Aptitude to a competitive exam is to test your ability to solve basic mathematical problems logically.

#### Learning Objectives:

- Remembering the concept of Logarithms.
- Understanding the concept of Simple Interest – Compound Inters

<b>Unit - I</b>	<b>Simple Interest</b>	<b>09 Hours</b>
Simple Interest – Compound Interest.(Chap – 21 & 22 )		
<b>Unit - II</b>	<b>Logarithms</b>	<b>09 Hours</b>
Logarithms - Area.(Chap – 23 & 24)		
<b>Unit - III</b>	<b>Volume</b>	<b>09 Hours</b>
Volume & Surface Areas – Races & Games of Skill. (Chap – 25 & 26)		
<b>Unit - IV</b>	<b>Calendar</b>	<b>09 Hours</b>
Calendar - Clocks.(Chap – 27 & 28)		
<b>Unit - V</b>	<b>Stocks</b>	<b>09 Hours</b>
Stocks & Shares.(Chap – 29)		

**Text Book(s):**

1. R. S. Aggarwal, Quantitative Aptitude for Competitive Examinations, S. Chand co Ltd., 152. Anna Salai, Chennai, 2010

**Reference Books:**

1. Quantitative Aptitude ‘by Abhijit Guha, Tata McGraw Hill Publishing Company Limited, New Delhi (2005)

**Web Resources:**

1. <https://nptel.ac.in/courses/110104066>
2. <https://www.mygreatlearning.com/academy/learn-for-free/courses/quantitative-aptitude-basics>

**Teaching Methodology:** Videos, Audios, PPT, Role Play, Field Visit, Seminar, Chalk & Talk, Lecturing, Case Study, Demonstration, Problem Solving, Group Discussion, Flipped Learning

**Learning Outcomes:**

Upon successful completion of this course, the student will be able to

COs	Statements	Bloom's Level
CO1	Explain in detail about Simple Interest and Compound Interest	K1
CO2	Explain Logarithms and Area.	K2
CO3	Explain Volume & Surface Areas and Races & Games of Skill.	K3
CO4	Explain Calendar and Clocks.	K4
CO5	Explain Stocks & Shares.	K5
K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create		

**Mapping (COs vs POs)**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	S	L	S	-	-	-	S	M	L
CO2	M	L	S	L	-	-	S	M	L
CO3	S	L	S	L	-	-	S	M	L
CO4	S	L	S	-	-	-	S	M	L
CO5	S	L	S	-	-	-	S	M	L

S - Strong, M – Medium, L – Low

<b>Semester: III</b>	<b>Course Code: 23USTAT01</b>	<b>Hours/Week: 4</b>	<b>Credit: 4</b>
<b>COURSE TITLE: ELECTIVE COURSE III - ALLIED STATISTICAL METHODS – I</b>			

**Course Overview:**

1. statistics is the application of probability theory, a branch of mathematics, to statistics, as opposed to techniques for collecting statistical data

**Learning Objectives:**

1. To introduce the basic concepts of probability theory, random variables, probability distribution.
2. To introduce the statistical concepts and develop analytical skills.

<b>Unit - I</b>	<b>Probability, Random Variable and Mathematical Expectation</b>	<b>09 Hours</b>
-----------------	--	-----------------

Definitions – Addition and Multiplication Theorem of Probability – Conditional probability – Random variable ( discrete and continuous) – Distribution functions – Marginal and Conditional Distributions – Mathematical Expectation – Moment generating function – Characteristic function (concept only) – Tchebychev's inequality - Simple Problems.

<b>Unit - II</b>	<b>Discrete and Continuous Distributions</b>	<b>09 Hours</b>
------------------	--	-----------------

Binomial and Poisson Distributions – Derivations – Properties and Applications - Simple Problems – Normal distribution – Derivations – Properties and Applications - Simple Problems

<b>Unit - III</b>	<b>Measures of Central Tendency, Measures of Dispersion and Skewness</b>	<b>09 Hours</b>
-------------------	--	-----------------

Definitions – Mean , Median , Mode , Geometric mean , Harmonic mean – Merits and demerits – Range , Quartile deviation , Mean deviation and their coefficients - Standard deviation – Coefficient of Variation - Merits and demerits – Measure of Skewness – Karl Pearson's and Bowley's Coefficient of Skewness.

<b>Unit - IV</b>	<b>Curve Fitting</b>	<b>09 Hours</b>
------------------	----------------------	-----------------

Method of least square – Fitting of a straight line and second degree Parabola, Fitting of Power Curve and Exponential Curves – Simple Problem.

<b>Unit - V</b>	<b>Correlation and Regression</b>	<b>09 Hours</b>
-----------------	-----------------------------------	-----------------

Definition – Types and methods of measuring correlation – Scatter diagram , Karl Pearson’s correlation coefficient and Spearman rank correlation coefficient - Regression lines - Regression coefficients – Properties – Regression equations

**Text Book(s):**

1. Gupta S. C and Kapoor V. K (2004), Fundamentals of Mathematical Statistics, (11th edition), Sultan Chand & Sons, New Delhi.
2. Gupta. S. P. (2001), Statistical Methods, Sultan Chand & Sons, New Delhi.

**Reference Books:**

1. Sancheti D. C and Kapoor V. K (2005), Statistics (7th Edition), Sultan Chand & Sons, New Delhi.
2. Robert V. Hogg, Allen T. Craig, Joseph W. McKean, Introduction to mathematical statistics, Pearson Education. .

**Web Resources:**

1. [https://onlinecourses.nptel.ac.in/noc24\\_ma30/preview](https://onlinecourses.nptel.ac.in/noc24_ma30/preview)
2. <https://www.mooc-list.com/tags/statistics>

**Teaching Methodology:** Videos, Audios, PPT, Role Play, Field Visit, Seminar, Chalk & Talk, Lecturing, Case Study, Demonstration, Problem Solving, Group Discussion, Flipped Learning

**Learning Outcomes:**

Upon successful completion of this course, the student will be able to

COs	Statements	Bloom’s Level
CO1	Understand the random experiments in real life situations.	K1
CO2	Understand the axioms of probability in real life situations.	K2
CO3	Compute Bernoulli trials and understand the rare case population	K3
CO4	Learn the usage of central tendencies, dispersion and skewness	K4
CO5	Obtain the relationship between two random variables.	K5
K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create		

Mapping (COs vs POs)									
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	S	S	M	M	M	S	M	S	M
CO2	S	S	S	S	M	S	M	S	M
CO3	S	S	S	M	S	S	S	S	L
CO4	S	S	S	M	S	S	S	S	M
CO5	S	S	M	M	M	S	S	S	M

S - Strong, M – Medium, L – Low

Semester: III	Course Code: 23USTAT04	Hours/Week: 4	Credit: 3
<b>Course Title: Allied – For ALL UG (Computer Science)</b> <b>Common for B.Sc. (Information Science) and B.C.A., B.Sc., (A.I &amp;D.S.,)</b> <b>ELECTIVE COURSE EC III – GENERIC SPECIFIC - STATISTICAL METHODS AND ITS APPLICATIONS – I</b>			

#### Course Overview:

1. This will be specifically done by equipping students with the context covered in the text book and also the cases and articles covering wide range of topics. This course introduces students to deals with application of statistical methods to business problems. This course covers descriptive statistics, elementary probability.

#### Learning Objectives:

1. Analyze the sample data and its usage in different ways such as locations, dispersion.
2. Understand the relationship between variables and forecasting the future values.

<b>Unit - I</b>	<b>Collection and Presentation of Statistical Data</b>	<b>09 Hours</b>
-----------------	--	-----------------

Nature and Scope of Statistics – Limitations – Types of data – Classification and Tabulation of Data – Construction of Frequency Distribution – Diagrammatic and Graphical Representation of Data.

<b>Unit - II</b>	<b>Measures of Central Tendency</b>	<b>09 Hours</b>
------------------	-------------------------------------	-----------------

Mean, Median, Mode, Geometric mean, Harmonic mean – Characteristics of a good average – Merits and demerits.

<b>Unit - III</b>	<b>Measures of Dispersion</b>	<b>09 Hours</b>
-------------------	-------------------------------	-----------------

Range – Quartile deviation – Mean deviation and their coefficients – Standard deviation – Coefficient of variation – Merits and demerits.



<b>Unit - IV</b>	<b>Correlation and Regression</b>	<b>09 Hours</b>
------------------	-----------------------------------	-----------------

Types and Methods for Measuring Correlation - Scatter diagram – Karl Pearson’s co-efficient of correlation – Spearman’s rank correlation coefficient – Regression equations of two variables – Simple Problems.

<b>Unit - V</b>	<b>Probability</b>	<b>09 Hours</b>
-----------------	--------------------	-----------------

Definition of Probability – Addition and Multiplication Theorems – Conditional probability – Simple Problems.

### Reference Books:

1. Gupta S. P. (2001), Statistical Methods, Sultan Chand & Sons, New Delhi
2. Pillai R. S. N. And Bagavathi. V. (2005), Statistics, S. Chand & Company Ltd., New Delhi
3. Sancheti D. C. And Kapoor. V. K (2005), Statistics (7th Edition), Sultan Chand & Sons, New Delhi.

### Web Resources :

1. <https://nptel.ac.in/>

**Teaching Methodology:** Videos, Audios, PPT, Role Play, Field Visit, Seminar, Chalk & Talk, Lecturing, Case Study, Demonstration, Problem Solving, Group Discussion, Flipped Learning

### Learning Outcomes:

Upon successful completion of this course, the student will be able to

COs	Statements	Bloom’s Level
CO1	Understand the statistical methods measures of location.	K1
CO2	Understand the statistical methods measures of dispersion	K2
CO3	Apply the statistical methods of dispersion and location	K3
CO4	Understand the relationship between variables and forecasting the future values	K4
CO5	Understand the concept of sampling, sampling errors and types of sampling	K5
K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create		

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	L	M	M	L	L	M	L	S	S
CO2	M	L	L	L	L	M	M	L	S
CO3	L	L	L	L	L	M	M	L	S
CO4	M	L	L	M	L	L	M	L	S
CO5	M	L	L	L	L	M	M	L	S

S - Strong, M – Medium, L – Low

Semester: III	Course Code: 23USTAT10	Hours/Week: 4	Credit: 3
<b>Course Title: B.COM &amp; B.COM (CA) &amp; B.COM (PA)</b> <b>Business Mathematics and Statistics</b>			

#### Course Overview:

This course is divided into two parts Business Mathematics (Part A) and Statistics (Part B). Part A enables the students to know the financial formulas, fractions; measurements involved in interest calculation, hire rates, salary calculation, tax calculation etc. which help complete business tasks efficiently. Whereas, Part B enables the learners to make various kinds of analysis on the basis of accurate estimates that helps a business to deal with uncertainties by forecasting seasonal, cyclic and general economic fluctuations.

1.

#### Learning Objectives:

- To impart knowledge on the basics of ratio, proportion, indices and proportions.
- To learn about simple and compound interest and arithmetic, geometric and harmonic progressions.

<b>Unit - I</b>	<b>Ratio</b>	<b>09 Hours</b>
-----------------	--------------	-----------------

Ratio, Proportion and Variations, Indices and Logarithms

<b>Unit - II</b>	<b>Interest and Annuity</b>	<b>09 Hours</b>
------------------	-----------------------------	-----------------

Banker's Discount – Simple and Compound Interest - Arithmetic, Geometric and Harmonic Progressions. Annuity - Meaning - Types of Annuity Applications.

<b>Unit - III</b>	<b>Business Statistics Measures of Central Tendency</b>	<b>09 Hours</b>
-------------------	---	-----------------

Arithmetic Mean, Geometric Mean - Harmonic Mean - Mode and Median – Quartiles – Deciles - Percentiles. Measures of Variation – Range - Quartile Deviation and Mean Deviation - Variance and Standard Deviation & Co-efficient.

<b>Unit - IV</b>	<b>Correlation and Regression</b>	<b>09 Hours</b>
------------------	-----------------------------------	-----------------

Correlation - Karl Pearson's Coefficient of Correlation – Spearman's Rank Correlation – Regression Lines and Coefficients

<b>Unit - V</b>	<b>Time Series Analysis and Index Numbers</b>	<b>09 Hours</b>
-----------------	---	-----------------

Time Series Analysis : Secular Trend – Seasonal Variation – Cyclical variations - Index Numbers – Aggregative and Relative Index – Chain and Fixed Index – Wholesale Index – Cost of Living Index.

### Text Book(s):

1. Dr. B.N. Gupta, Business Mathematics & Statistics, Shashibhawan publishing house, Chennai
2. Asim Kumar Manna, Business Mathematics & Statistics, McGraw hill education, Noida

### Reference Books:

1. Dr. B.N. Gupta, Business Mathematics & Statistics, Shashibhawan publishing house, Chennai
2. G.M. The fundamentals of Mathematical Analysis, vol I. Pergamon Press, New York, 1965.
3. Andre Francis, Business Mathematics & Statistics, Cengage Learning EMEA, Andover

### Web Resources:

<https://corporatefinanceinstitute.com/resources/data-science/central-tendency/>

**Teaching Methodology:** Videos, Audios, PPT, Role Play, QUIZ, Field visit, Seminar, Chalk & Talk, Lecturing, Case study, Demonstration, Problem solving, Group discussion, Flipped Learning

### Learning Outcomes:

Upon successful completion this course, the student will be able to:

COs	Statements	Bloom's Level
CO1	Learn the basics of ratio, proportion, indices and logarithm	K1
CO2	Familiarise with calculations of simple and compound interest and arithmetic, geometric and harmonic progressions.	K2
CO3	Determine the various measures of central tendency	K3
CO4	Calculate the correlation and regression co-efficient.	K4
CO5	Assess problems on time series analysis.	K5

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

Mapping (COs vs POs)									
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
<b>CO1</b>	L	L	S	L	M	-	L	M	S
<b>CO2</b>	L	L	S	L	M	-	L	M	S
<b>CO3</b>	L	L	L	L	M	-	L	M	S
<b>CO4</b>	L	L	L	L	M	-	L	M	S
<b>CO5</b>	L	L	M	L	M	-	L	M	S

**S - Strong, M – Medium, L – Low**