V.V.VANNIAPERUMAL COLLEGE FOR WOMEN
(Belonging to Virudhunagar Hindu Nadars)
An Autonomous Institution Affiliated to Madurai Kamaraj University, Madurai
Re-accredited with 'A' Grade (3rd Cycle) by NAAC
VIRUDHUNAGAR - 626 001

OUTCOME BASED EDUCATION WITH CHOICE BASED CREDIT SYSTEM REGULATIONS AND SYLLABUS
(with effect from Academic Year 2020-2021)

V.V.Vanniaperumal College for Women, Virudhunagar, established in1962, offers 20 UG Programmes, 14 PG Programmes, 6 M.Phil. Programmes and 6 Ph.D. Programmes. The curricula for all these Programmes, except Ph.D.Programmes, have been framed as per the guidelines given by the University Grants Commission (UGC) & Tamil Nadu State Council for Higher Education (TANSCHE) under Choice Based Credit System (CBCS) and the guidelines for Outcome Based Education (OBE).

The Departments of Commerce, English History, Mathematics, Biochemistry and Tamil upgraded as Research Centres offer Ph.D. Programmes as per the norms and regulations of Madurai Kamaraj University, Madurai and do not come under the purview of CBCS.

A. CHOICE BASED CREDIT SYSTEM (CBCS)

The CBCS provides an opportunity for the students to choose Courses from the prescribed Courses. The CBCS is followed as per the guidelines formulated by the UGC. The performance of students is evaluated based on the uniform grading system. Computation of the Cumulative Grade Point Average (CGPA) is made to ensure uniformity in evaluation system.

List of Programmes in which CBCS /Elective Course System is implemented

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UG PROGRAMMES

Arts & Humanities	: History (E.M. & T.M.), English, Tamil
Physical &Life Sciences	: Mathematics, Zoology, Chemistry, Physics, Biochemistry, Home Science-Nutrition and Dietetics, Costume Design and Fashion, Microbiology, Biotechnology, Computer Science, Information Technology and Computer Applications.
Commerce& Management	: Commerce, Commerce (Computer Applications), Commerce (Professional Accounting), Business Administration

PG PROGRAMMES

Arts & Humanities	: History, English, Tamil
Physical & Life Sciences	: Mathematics, Physics, Chemistry, Zoology, Biochemistry, Home Science-Nutrition and Dietetics, Computer Science, Information Technology, Computer Applications (MCA*)
Commerce & Management	: Commerce, Business Administration (MBA*)

*AICTE approved Programmes

PRE - DOCTORAL PROGRAMMES (M.Phil.)

Arts & Humanities	: History, English, Tamil
Physical & Life Sciences	: Mathematics, Biochemistry
Commerce & Management	: Commerce

OUTLINE OF CHOICE BASED CREDIT SYSTEM-UG

1. Core Courses
2. Discipline Specific Elective Courses (DSEC)
3. Allied Courses
4. Skill Enhancement Courses (SEC)
5. Non Major Elective Courses (NMEC)
6. Ability Enhancement Compulsory Courses (AECC)
7. Generic Elective Courses (GEC)
8. Internship/Field Project
9. Self Study Courses
10. Extra Credit Courses (optional)

List of Non Major Elective Courses (NMEC) Offered

UG PROGRAMMES

Name of the Course	Semester	Department
History of India upto A.D.1858	III	History(EM)
இந்திய வரலாறு கி.பி.1858 வரை	III	History(TM)
Indian National Movement (A.D 1885-1947)	IV	History(EM)
இந்திய தேசிய இயக்கம்(கி.பி.1885 – 1947)	IV	History(TM)
English for Professions I	III	English
English for Professions II	IV	
இக்கால நீதி இலக்கியம்	III	Tamil
உரைநடை இலக்கியம்	IV	
Basic Hindi–I	III	Hindi
Basic Hindi– II	IV	
Practical Banking	III	Commerce
Basic Accounting Principles	IV	
Business Management	III	Business Administration
Entrepreneurship	IV	
Quantitative Aptitude	III	Mathematics
Statistics and Operation Research	IV	
Physics in Everyday life	III	Physics
Fundamentals of Electronics	IV	
Industrial Chemistry	III	Chemistry
Drugs and Natural Products	IV	
Applied Zoology	III	Zoology
Animal Science	IV	
Basic Food Science	III	Home Science– Nutrition and Dietetics
Basic Nutrition and Dietetics	IV	
Women and Health	III	Biochemistry
Lifestyle associated disorders	IV	
Medical Lab Technology	III	Microbiology
Applied Microbiology	IV	
Infectious Diseases	III	Biotechnology
Organic Farming	IV	
Basics of Fashion	III	Costume Design and Fashion
Interior Designing	IV	
Introduction to Computers and Office Automation	III	Computer Science
Introduction to Internet and HTML 5	IV	
Computer Fundamentals and E-mail	III	Information Technology
MS Office	IV	
Fundamentals of Computers	III	Computer Applications
Web Design with HTML	IV	
Horticulture–I	III	Botany
Horticulture– II	IV	
மருத்துவ தாவரவியல் - I	III	
மருத்துவ தாவரவியல் - II	IV	
Library and Information Science - I	III	Library Science
Library and Information Science - II	IV	

மேல்நிலை கல்வி வரை தமிழை முதன்மை பாடமாக எடுத்து படிக்காத மாணவிகள் கீழ்கண்ட பாடங்களை கட்டாயம் படிக்க வேண்டும்

1. அடிப்படைத் தமிழ் - எழுத்தறிதல்
2. அடிப்படைத் தமிழ் - மொழித்திறனறிதல்

List of Non Major Elective Courses (NMEC)

(2023-2024 onwards)

UG PROGRAMMES

Name of the Course	Semester	Department
History of India upto A.D.1858	III	History(EM)
இந்திய வரலாறு கி.பி. 1858 வரை	III	History (TM)
Indian National Movement (A.D 1885-1947)	IV	History(EM)
இந்திய தேசிய இயக்கம் (கி.பி. 1885 – 1947)	IV	History(TM)
English for Professions I	III	English
English for Professions II	IV	
இக்கால நீதி இலக்கியம்	III	Tamil
உரைநடை இலக்கியம்	IV	
Basic Hindi – I	III	Hindi
Basic Hindi – II	IV	
Fundamental Hindi – I	III	Hindi
Fundamental Hindi – II	IV	
Practical Banking	III	Commerce
Basic Accounting Principles	IV	
Financial Literacy I	III	
Financial Literacy II	IV	
Self-Employment And Start-Up Business	III	Commerce CA
Fundamentals Of Marketing	IV	
Women Protection Laws	III	Commerce (Professional Accounting)
Basic Labour Laws	IV	
Business Management	III	Business Administration
Entrepreneurship	IV	
Quantitative Aptitude I	III	Mathematics
Basic Statistics		
Quantitative Aptitude II	IV	
Operations Research		
Physics in Everyday life –I	III	Physics
Physics in Everyday life –II	IV	
Industrial Chemistry	III	Chemistry
Drugs and Natural Products	IV	
Applied Zoology	III	Zoology
Animal Science	IV	

Basic Food Science	III	Home Science – Nutrition and Dietetics
Basic Nutrition and Dietetics	IV	
Women and Health	III	Biochemistry
Lifestyle Associated Disorders	IV	
Medical Lab Technology	III	Microbiology
Applied Microbiology	IV	
Infectious Diseases	III	Biotechnology
Organic Farming	IV	
Basics of Fashion	III	Costume Design And Fashion
Interior Designing	IV	
Introduction to Computers and Office Automation	III	Computer Science
Introduction to Internet and HTML 5	IV	
MS Office	III	Information Technology
Introduction to HTML	IV	
Fundamentals of Computers	III	Computer Applications
Web Design with HTML	IV	
Horticulture – I	III	Botany
Horticulture – II	IV	
மருத்துவ தாவரவியல் - I	III	
மருத்துவ தாவரவியல் - II	IV	
Library and Information Science – I	III	Library Science
Library and Information Science - II	IV	
Cadet Corps for Career Development I	III	National Cadet Corps
Cadet Corps for Career Development II	IV	

மேல்நிலைக் கல்வி வரை தமிழை முதன்மைப் பாடமாக எடுத்துப் படிக்காத மாணவிகள் கீழ்க்கண்ட பாடங்களைக் கட்டாயம் படிக்க வேண்டும்

1. அடிப்படைத் தமிழ் - எழுத்தறிதல்
2. அடிப்படைத் தமிழ் - மொழித்திறனறிதல்

List of Ability Enhancement Compulsory Courses (AECC) &

Generic Elective Courses (GEC) Offered

ABILITY ENHANCEMENT COMPULSORY COURSES (AECC)

1. Value Education
2. Environmental Studies

GENERIC ELECTIVE COURSES1

1. Human Rights
2. Women Studies

GENERIC ELECTIVE COURSES2

1. Constitution of India
2. Modern Economics
3. Adolescent Psychology
4. Disaster Management

B. OUTCOME BASED EDUCATION (OBE) FRAMEWORK

The core philosophy of Outcome Based Education rests in employing a student - centric learning approach to measure the performance of students based on a set of pre-determined outcomes. The significant advantage of OBE is that it enables are vamp of the curriculum based on the learning outcomes, upgrade of academic resources, quality enhancement in research and integration of technology in the teaching – learning process. It also helps in bringing clarity among students as to what is expected of them after completion of the Programme in general and the Course in particular. The OBE directs the teachers to channelize their teaching methodologies and evaluation strategies to attain the PEO sand fulfill the Vision and Mission of the Institution.

Vision of the Institution

The founding vision of the Institution is to impart Quality Education to the rural women folk and to empower them with knowledge and leadership quality.

Mission of the Institution

The mission of the Institution is to impart liberal education committed to quality and excellence. Its quest is to mould learners into globally competent individuals in stilling in them life - oriented skills, personal integrity, leadership qualities and service mindedness.

B.1Programme Educational Objectives, Programme Outcomes and Programme Specific Outcomes

It is imperative for the institution to set the Programme Educational Objectives (PEOs), Programme Outcomes (POs) and Course Outcomes (COs), consistent with its Vision and Mission statements. The PEOs and the POs should be driven by the mission of the institution and should provide distinctive paths to achieve the stated goals. The PEOs for each Programme have to fulfill the Vision and Mission of the Department offering the Programme.

Vision of the Department of Mathematics

- To impart intensive knowledge and skills to rural students through quality education and to provide an environment where students become competent users of Mathematics in other disciplines.

Mission of the Department of Mathematics

- To empower the students with profound knowledge in Mathematics, logical reasoning and analytical skills, to induce their passion for research and lifelong learning with a focus on moralvalues and social ethics.

B.1.1 Programme Educational Objectives (PEOs)

PEOs are broad statements that describe the career and professional achievements that the Programme is preparing the graduates to achieve within the first few years after graduation. PEOs are framed for each Programme and should be consistent with the mission of the Institution.

Programme Educational Objectives (PEOs) of B.Sc. Mathematics Programme

The students will be able to

- □ become successful teachers in schools, Bank officers, government officials, Statisticians and IT professionals.
- □ apply mathematical skills in analyzing and solving problems in real life situations.
- □ upgrade themselves by pursuing higher education and engaging in social work to boost their morality.

Key Components of the Mission Statement	PEO1	PEO2	PEO3
Profound knowledge in Mathematics	√	√	√
Logical reasoning and analytical Skills	√	√	-
Focus on moral and ethical Values	√	-	√

B.1.2 Programme Outcomes (POs)

POs shall be based on Graduate Attributes (GAs) of the Programme. The GAs are the attributes expected of a graduate from a Programme in terms of knowledge, skills, attitude and values. The Graduate Attributes include Disciplinary Knowledge, Communication Skills, Critical Thinking, Problem Solving, Analytical Reasoning, Research Related Skills,

Co- operation/ Team Work, Scientific Reasoning, Reflective Thinking, Information/ Digital Literacy, Multicultural Competence, Moral and Ethical Awareness / Reasoning, Leadership Qualities and Lifelong Learning.

On successful completion of the Programme, the students will be able to

1 apply effectively the acquired knowledge and skill in the field of Arts, Physical Science, Life Science, Computer Science, Commerce and Management for higher studies and employment. (*Disciplinary Knowledge*)

2 communicate proficiently and confidently with the ability to express original/complex ideas effectively in different situations.(*Communication Skills)*

3 identify, formulate and solve problems in real life situations scientifically/ systematically by adapting updated skills in using modern tools and techniques. (*Scientific Reasoning and Problem Solving)*

4 critically analyse, synthesize and evaluate data, theories and ideas to provide valid suggestions for the betterment of the society. (*Critical Thinking and Analytical Reasoning)*

5 use ICT in a variety of self-directed lifelong learning activities to face career challenges in the changing environment. (*Digital Literacy, Self - directed and Lifelong Learning)*

6 self-manage and function efficiently as a member or a leader in diverse teams in a multicultural society for nation building. (*Co-operation/ Team Work and Multicultural Competence)*

7 uphold the imbibed ethical and moral values in personal, professional and social life for sustainable environment. (*Moral and Ethical Awareness)*

B.1.3 Programme Specific Outcomes (PSOs)

Based on the Programme Outcomes, Programme Specific Outcomes are framed for each UG Programme**.** Programme Specific Outcomes denote what the students would be able to do at the time of graduation. They are Programme specific. It is mandatory that each PO should be mapped to the respective PSO.

On completion of B.Sc. Mathematics Programme, the students will be able to

PO1-*Disciplinary Knowledge*

PSO1.a: apply the strong knowledge acquired in core and related areas of mathematics and itsapplications to continue higher studies or for employment.

PSO 1.b: apply the concrete subject knowledge and skill obtained in mathematics and carrier oriented courses to appear for competitive examinations.

PO2–*Communication Skills*

PSO2: communicate efficaciously on complex mathematical concepts, theorems and models withmathematics community and with society at a large.

PO3–*Scientific Reasoning and Problem Solving*

PSO 3.a: implement logical reasoning and analytical skills in mathematics as foundation for advanced cases in other disciplines.

PSO3.b: formulate real life problems into mathematical model and apply mathematical techniques tofind solutions to the problems.

PO4–*Critical Thinking and Analytical Reasoning*

PSO 4.a: consider the social, cultural, economic and environmental constraints, apply the mathematical knowledge and skills to arrive at optimal solutions.

PSO 4.b: analyse mathematical data using principles of mathematics, interpret the results andprovide valid conclusions applicable to various sectors of the nation.

PO5–*Digital Literacy, Self-directed and Lifelong Learning*

PSO5: make use of e-resources and strive for self- directed life long learning in their field of interest toface career challenges.

PO6–*Co-operation / Team Work and Multicultural Competence*

PSO6: work effectively as a member or leader of a diverse team in multidisciplinary environment tobring multicultural richness in mathematics.

PO7–*Moral and Ethical Awareness*

PSO7: practice the code of ethics of mathematics community in their career.

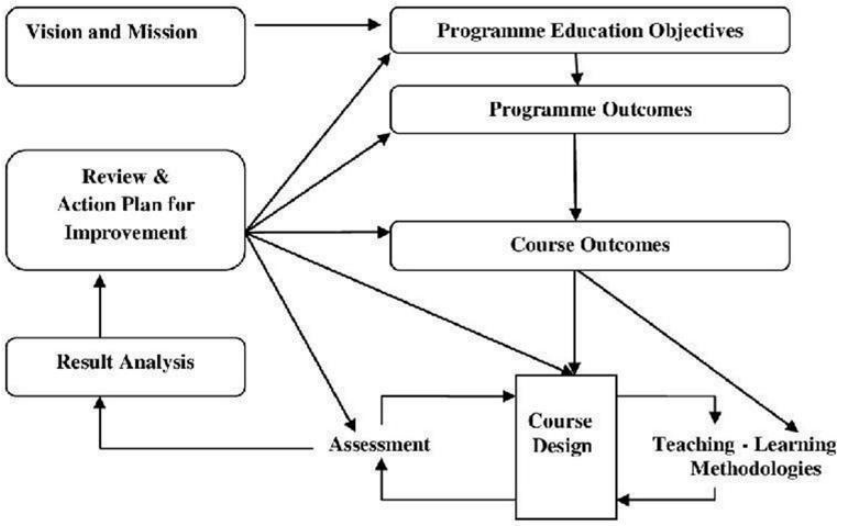
PO-PEO Mapping Matrix

Attainment of PEOs can be measured by a PO-PEO matrix. PEOs should evolve through constant feedback from alumnae, students, industry, management, *etc*. It is mandatory that each PEO should be mapped to at least one of the POs.

POs / PSOs	PEO1	PEO2	PEO3
PO1/PSO1	✓	✓	✓
PO2/PSO2	✓	-	✓
PO3/PSO3	✓	✓	✓
PO4/PSO4	✓	✓	✓
PO5/PSO5	✓	✓	✓
PO6/PSO6	✓	✓	✓
PO7/PSO7	✓	-	✓

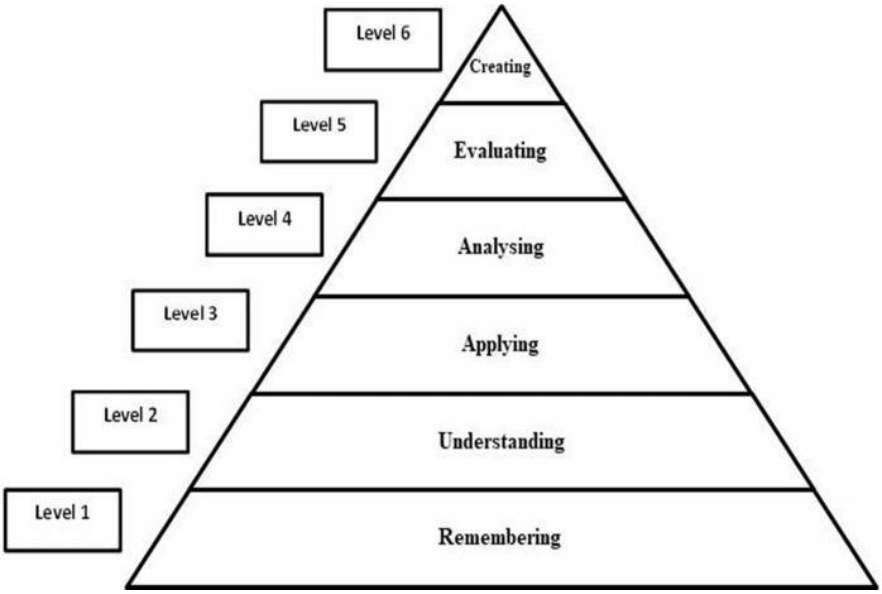
B.1.4 Course Outcomes (COs)

Course Outcomes are narrow statements restricted to the Course contents given in five units. Course Outcomes describe what students would be capable of, after learning the contents of the Course. They reflect the level of knowledge gained, skills acquired and attributes developed by the students after learning of Course contents. COs are measurable, attainable and manage able in number. COs contribute to attain POs in such away that each CO addresses at least one of the POs and also each PO is reasonably addressed by adequate number of COs.



It is important to determine the methods of assessment. A comprehensive assessment Strategy may be outlined using the revised Bloom's Taxonomy levels.

BLOOM'STAXONOMY



CO–PO Mapping of Courses

After framing the CO statements, the COs framed for each Course is mapped with POs based on the relationship that exists between them. The COs which are not related to any of the POs is indicated with (-), signifying Nil. Measurement Mapping is based on Four Points Scale [High(H), Medium (M), Low(L) and Nil(-)]. For calculating weighted percentage of contribution of each Course in the attainment of the respective POs, the weights assigned for H,M and L are3, 2and1respectively.-

CO-PO/PSO Mapping Table (Course Articulation Matrix)

PO/PSOs / COs	PO1/ PSO1	PO2/ PSO2	PO3/ PSO3	PO4/ PSO4	PO5/ PSO5	PO6/ PSO6	PO7/ PSO7
CO1							
CO2							
CO3							
CO4							
CO5							

ELIGIBILITY FOR ADMISSION

The candidate should have passed the Higher Secondary Examination conducted by the Board of Higher Secondary Education, Tamil Nadu or any other equivalent examination accepted by the Academic Council with Mathematics as one of the subjects in Higher Secondary Course.

DURATION OF THE PROGRAMME

The candidates shall undergo the prescribed Programme of study for a period of three academic years (six semesters).

MEDIUM OF INSTRUCTION

English

COURSES OFFERED

Part I	:	Tamil/Hindi/ Alternate Course
Part II	:	English
Part III	:	Core Courses
	:	Allied Courses
	:	Elective Courses: Discipline Specific Elective Courses
	:	Self Study Course
Part IV	:	Skill Enhancement Courses (SEC)
	:	Field Project/Internship
	:	Non-Major Elective Courses (NMEC)
	:	Ability Enhancement Compulsory Courses (AECC)
	:	Generic Elective Courses (GEC)
	:	Self Study Course
Part V	:	National Service Scheme/ Physical Education/Youth Red Cross Society/ Red Ribbon Club/ Science Forum/ Eco Club/ Library and Information Science/ Consumer Club / Health and Fitness Club and National Cadet Corps/ Rotaract Club

B.2.EVALUATION SCHEME

B.2.1 PART II

Components	Internal Assessment Marks	External Examination Marks	Total Marks
Theory	15	75	100
Practical	5+5	-	

INTERNAL ASSESSMENT

Distribution of Marks

Mode of Evaluation		Marks
Periodic Test	:	15
Practical	:	10
Total	**:**	**25**

Three Periodic Tests - Average of the best two will be considered

B.2.1.1 PART II (II UG – 2023-2024 onwards)

Components	Internal AssessmentMarks	External Examination Marks	Total Marks
Test	15	60	100
Practical	25	15	

INTERNAL ASSESSMENT

Distribution of Marks

Mode of Evaluation		Marks
Periodic Test	:	15
Practical	:	10
Total	**:**	**25**

Three Periodic Tests - Average of the best two will be considered

EXTERNAL ASSESSMENT

Distribution of Marks

Mode of Evaluation		Marks
Theory	:	60
Practical	:	15
Total	**:**	**75**

B.2.1 Part I &PART III-Core Courses, Discipline Specific Elective Courses &Allied Courses

Components	Internal Assessment Marks	External Examination Marks	Total Marks
Theory	25	75	100
Practical	40	60	100
Project	100	-	100

INTERNAL ASSESSMENT

Distribution of Marks

Theory

Mode of Evaluation			Marks
Periodic Test		:	15
Assignment	Core:I UG-K4 Level, II & III UG – K5 Level	:	5
	Part I & Allied: K4 Level		
	DSEC:K5 Level		
Quiz	K2:Level	:	5
Total		**:**	**25**

Three Periodic Tests- Average of the best two will be considered

Two Assignments -Better of the two will be considered

Three Quiz Tests -Best of the three will be considered

Practical

Mode of Evaluation		Marks
Continuous Assessment	:	15
Model Examination		15
Performance	:	10
Total	**:**	**40**

Model Examination - Average of the best two will be considered

Performance -Attendance and Record

Question Pattern for Periodic Tests **Duration: 2 Hours**

Section	Types of Question	No. of Questions	No. of Questions To be answered	Marks for each Question	Total Marks
A Q.No.(1-4)	Multiple Choice	4	4	1	4
B Q.No.(5-7)	Internal Choice- Either Or Type	3	3	7	21
C Q.No.(8-9)	Internal Choice- Either Or Type	2	2	10	20
Total					**45***

***The total marks obtained in the Periodic Test will be calculated for15 marks

EXTERNAL EXAMINATION

Question Pattern **Duration: 3 Hours**

Section	Types of Question	No. of Questions	No. of Questions to be answered	Marks For each Question	Total Marks
A Q.No.(1-10)	Multiple Choice	10	10	1	10
B Q.No.(11-15)	Internal Choice- Either Or Type	5	5	7	35
C Q.No.(16-18)	Internal Choice- Either Or Type	3	3	10	30
				Total	**75**

PROJECT

Assessment by Internal Examiner only

Internal Assessment

Distribution of Marks

Mode of Evaluation		Marks
Project Work and Report	:	60
Presentation and Viva-voce	:	40
Total	**:**	**100**

B.2.2 PART III-SELF STUDYCOURSE
Core Courses Quiz – Online

Assessment by Internal Examiner only

- Question Bank is prepared by the Faculty Members of the Departments.
- No. of Questions to be taken 700.
- Multiple Choice Question pattern is followed.
- Online Test will be conducted in VI Semester for 100 Marks.
- Model Examination is conducted after two periodic tests.

Distribution of Marks

Mode of Evaluation		Marks
Periodic Test	:	40
Model Examination	:	60
Total	**:**	**100**

Two Periodic Tests - Better of the two will be considered

B.2.3 PART IV – Skill Enhancement Courses & Non Major Elective Course

INTERNAL ASSESSMENT
Distribution of Marks
Theory

Mode of Evaluation			Marks
Periodic Test		:	25
Assignment	SEC:K4 Level	:	10
	NMEC:K3 Level		
Quiz	K2 Level	:	5
Total		**:**	**40**

Three Periodic tests - Average of the best two will be considered

Two Assignments - Better of the two will be considered

Three Quiz Tests - Best of the three will be considered

Practical

Mode of Evaluation		Marks
Continuous Assessment	:	15
Model Examination	:	15
Performance	:	10
Total	**:**	**40**

Model Examination - Average of the best two will be considered

Performance - Attendance and Record

Question Pattern **Duration: 1 Hour**

Section	Types ofQuestion	No. of Questions	No. of Questions to be answered	Marks for each Question	Total Marks
A Q.No.(1-3)	Internal Choice - Either Or Type	3	3	5	15
B Q.No.(4)	Internal Choice - Either Or Type	1	1	10	10
Total					**25**

EXTERNAL EXAMINATION

Question Pattern Duration: 2 Hours

Section	Types ofQuestion	No. of Questions	No. of Questons to be answered	Marks foreach Question	Total Marks
A Q.No.(1-6)	Internal Choice - Either Or Type	6	6	5	30
B Q.No.(7-9)	Internal Choice - Either Or Type	3	3	10	30
Total					**60**

B.2.3 PART IV- Ability Enhancement Compulsory Courses (AECC) & Generic Elective Courses (GEC)

Assessment by Internal Examiner only

- Model Examination is conducted after two periodic tests.
- Book and Study Material prepared by the Faculty of the respective departments will be prescribed.

Distribution of Marks

Mode of Evaluation			Marks
Periodic Test		:	30
Assignment	K2 Level	:	10
Model Examination		:	60
Total		**:**	**100**

Two Periodic tests -Better of the two will be considered

Two Assignments -Better of the two will be considered

Question Pattern for Periodic Test **Duration:1 Hour**

Section	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each Question	Total Marks
A Q.No.(1-3)	Internal Choice - Either Or Type	3	3	6	18
B Q.No.(4)	Internal Choice - Either Or Type	1	1	12	12
Total					**30**

Question Pattern for Model Examination **Duration: 2 Hours**

Section	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each Question	Total Marks
A Q.No.(1-5)	Internal Choice - Either Or Type	5	5	6	30
B Q.No.(6-8)	Internal Choice - Either Or Type	3	3	10	30
				Total	**60**

B. 2. 5 PART IV-Internship/ Field Project

Internship / Field Project is compulsory for II year UG Science Students

- **Internship:** A designated activity that carries one credit involving not less than 15 days of workingin an organization under the guidance of an identified mentor
- **Field Project:** Students comprising ofmaximum5 members in a team need to undertake a projectthat involves conducting surveys inside /outside the college premises and collection of data from designated communities or natural places.
- Assessment by Internal Examiner only

Mode of Evaluation		Marks
Onsite Learning/Survey	:	50
Report	:	25
Viva-Voce	:	25

SELF STUDY COURSE

Practice for Competitive Examinations-OnlineAssessment by Internal Examiner only

- Question Bank prepared by the Faculty Members of the respective Departments will be followed.
- Multiple Choice Question pattern is followed.
- Online Test will be conducted in V Semester for100Marks.
- Model Examination is conducted after two periodic tests.

Subject wise Allotment of Marks

Subject		**Marks**
Tamil	:	10
English	:	10
History	:	10
Mathematics	:	10
Current affairs	:	10
Commerce, Law & Economics	:	10
Physical Sciences	:	10
Life Sciences	:	15
Computer Science	:	5
Food and Nutrition	:	5
Sports and Games	:	5
Total		**100**

Distribution of Marks

Mode of Evaluation		**Marks**
Periodic Test	:	40
Model Examination	:	60
Total	**:**	**100**

Two Periodic Tests -Better of the two will be considered

B.2.6 PART V–Extension Activities

Assessment by Internal examiner only

Distribution of Marks

Mode of Evaluation		Marks
Attendance	:	5
Performance	:	10
Report/Assignment/Project/Camp/Practical	:	10
Total	**:**	**25***

*The marks obtained will be calculated for 100mark

B.2.7 EXTRACREDIT COURSES (OPTIONAL)

Assessment by Internal Examiner only

Distribution of Marks

Question Pattern **Duration: 3 Hours**

Section	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each Question	Total Marks
A Q.No.(1-10)	Multiple Choice	10	10	1	10
B Q.No.(11-15)	Internal Choice- Either or Type	5	5	9	45
C Q.No.(16-20)	Open Choice	5	3	15	15
Total					100

ELIGIBILITY FOR THE DEGREE

The candidate will not be eligible for the Degree without completing the prescribed Courses ofstudy, lab work, *etc.,* and a minimum Pass marks in all the courses.

- No Pass minimum for Internal Assessment.
- Pass minimum for External Examination is 27 marks out of 75 for Core Courses, Discipline Specific Elective Courses and Allied Courses.
- Pass minimum for External Examination is 21 marks out of 60 for Skill
- Enhancement Courses and Non Major Elective Courses.
- The aggregate minimum pass percentage is 40.
- Pass minimum for External Practical Examination is 21 marks out of 60 marks.
- Pass minimum for Ability Enhancement Compulsory Course and Generic Elective Course is 40.
- Pass minimum for Self Study Courses is 40.

- **ATTENDANCE**

(a) The students who have attended the classesfor76 days (85%) and above are permitted to appear for the Summative Examinations without any condition.

(b) The students who have only 60-75 days (66%-84%) of attendance are permitted to appear for the Summative Examinations after paying the required fine amount and fulfilling other conditions according to the respective cases.

(c) The students who have attended the classes for 59 days and less – upto 45days

(d) (50%-65%) can appear for the Summative Examinations only after getting special permission from the Principal.

(e) The students who have attended the classes for 44 days or less (<50%) cannot appear forthe Summative Examinations and have to repeat the whole semester.

- These rules are applicable to UG, PG and M.Phil. Programmes and come into effect from 2020 – 2021 onwards.
- For Certificate, Diploma, Advanced Diploma and Post Graduate Diploma Programmes, the students require 75% of attendance to appear for the Theory/ Practical Examinations.

B.3 ASSESSMENT MANAGEMENT PLAN

An Assessment Management Plan that details the assessment strategy both at the Programme and the Course levels is prepared. The continuous assessment is implemented using an assessment rubric to interpret and grade students.

B.3.1 Assessment Process for CO Attainment

Assessment is one or more processes carried out by the institution that identify, collect and prepare data to evaluate the achievement of Course Outcomes and Programme Outcomes. Course Outcome is evaluated based on the performance of students in the Continuous Internal Assessments and in End Semester Examination of a Course. Target levels of attainment shall be fixed by the Course teacher and Heads of the respective departments.

Direct Assessment (rubric based) –Conventional assessment tools such as Term Test, Assignment, Quiz and End Semester Summative Examination are used.

Indirect Assessment – Done through Course Exit Survey.

CO Assessment Rubrics

For the evaluation and assessment of Cos and Pos, rubrics are used. Internal assessment contributes 40% and End Semester assessment contributes 60% to the total attainment of a CO for the theory Courses. For the practical Courses, internal assessment contributes 50% and Semester assessment contributes 50% to the total attainment of a CO. Once the Course Outcome is measured, the PO can be measured using a CO-PO matrix.

CO Attainment

Direct CO Attainment

Course outcomes of all Courses are assessed and the CO– wise marks obtained by all the students are recorded for all the assessment tools. The respective CO attainment level is evaluated based on set attainment rubrics.

Attainment Levels of COs

Assessment Methods	Attainment Levels	
Internal Assessment	Level1	50% of students scoring more than average marks Or set target marks in Internal Assessment tools
	Level2	55% of students scoring more than average marks Or set target marks in Internal Assessment tools
	Level3	60% of students scoring more than average marks Or set target marks in internal Assessment tools
End Semester Summative Examination	Level1	50% of students scoring more than average marks or set target marks in End Semester Summative Examination
	Level2	55% of students scoring more than average marks Or set target marks in End Semester Summative Examination
	Level3	60% of students scoring more than average marks Or set target marks in End Semester Summative Examination

Target Setting for Assessment Method

For setting up the target of internal assessment tools, 55% of the maximum mark is fixed as target. For setting up the target of End Semester Examination, the average mark of the class shall be set as target.

Formula for Attainment for each CO

Attainment = Percentage of students who have scored more than the target marks

$$\text{Percentage of Attainment} = \frac{\text{Number of Students who Scored more than the Target}}{\text{Total Number of Students}} \times 100$$

Indirect CO Attainment

At the end of each Course, an exit survey is conducted to collect the opinion of the students on attainment of Course Outcomes. A questionnaire is designed to reflect the views of the students aboutthe attainment of Course outcomes.

Overall CO Attainment = 75% of Direct CO Attainment + 25% of Indirect CO Attainment

In each Course, the level of attainment of each CO is compared with the predefined targets. If the target is not reached, the Course teacher takes necessary steps for the improvement to reach the target.

For continuous improvement, if the target is reached, the Course teacher can set the target as avalue greater than the CO attainment of the previous year.

B.3.2 Assessment Process for Overall PO Attainment

With the help of CO against PO mapping, the PO attainment is calculated. PO assessment is done by giving 75% weightage to direct assessment and 25% weightage to indirect assessment. Direct assessment is based on CO attainment, where 75% weightage is given to attainment through End Semester examination and 25% weightage is given to attainment through internal assessments. Indirectassessment is done through Graduate Exit Survey and participation of students in Co-curricular/Extra- curricular activities.

PO Assessment Tools

Mode of Assessment	Assessment Tool	Description
Direct Attainment (Weightage -75%)	CO Assessment	This is computed from the calculated CO Attainment value for each Course
Indirect Attainment (Weightage-25%)	Graduate Exit Survey10%	At the end of the Programme, Graduate Exit Survey is collected from the graduates and it gives the opinion of the graduates on attainment of Programme Outcomes
	Co-curricular/ Extracurricular	For participation in Co-curricular/ Extracurricular activities during the period of their study.

Programme Articulation Matrix (PAM)

Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
Average Direct PO Attainment									
Direct PO Attainment in percentage									

Indirect Attainment of Pos for all Courses

POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
Graduate Exit Survey								
Indirect PO Attainment								

Attainments of Pos for all Courses

POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
Direct Attainment (Weightage -75%)								
Indirect Attainment (Weightage – 25%)								
Overall PO Attainment								

Overall PO Attainment = [75% of Direct PO Attainment +

25% of Indirect PO Attainment (Graduate Exit Survey

& Participation in Co-curricular and

Extracurricular Activities)]

POs	Level of Attainment
Value >= 70%	Excellent
Value >= 60% and Value<70%	Very Good
Value >= 50% and Value<60%	Good
Value >= 40% and Value<50%	Satisfactory
Value < 40%	Not Satisfactory

Level of PO attainment

Graduation Batch	Overall PO Attainment (in percentage)	Whether Expected Level of PO is Achieved? (Yes/No)

B.3.3 Assessment Process for PEOs

The curriculum is designed so that all the courses contribute to the achievement of PEOs. The attainment of PEOs is measured after 5 years of completion of the programme only through Indirect methods.

Target for PEO Attainment

Assessment Criteria	Target (UG)	Target (PG)
Record of Employment	25% of the class strength	30% of the class strength
Progression to Higher Education	40% of the class strength	5% of the class strength
Record of Entrepreneurship	2% of the class strength	5% of the class strength

Assessment Criteria &Tool	Weightage
Record of Employment	10
Progression to Higher Education	20
Record of Entrepreneurship	10
Feedback from Alumnae	30
Feedback from Parents	10
Feedback from Employers	20
Total Attainment	**100**

$$\text{Percentage of PEO Attainment from Employment} = \frac{\text{Number of Students who have got Employment}}{\text{Target}} \times 100$$

$$\text{Percentage of PEO Attainment from Higher Education} = \frac{\text{Number of Students who pursue Higher Education}}{\text{Target}} \times 100$$

$$\text{Percentage of PEO Attainment from Entrepreneurship} = \frac{\text{Number of Students who have become Entrepreneurs}}{\text{Target}} \times 100$$

Expected Level of Attainment for each of the Programme Educational Objectives

POs	Level of Attainment
Value >= 70%	Excellent
Value >= 60%andValue<70%	Very Good
Value >= 50%andValue<60%	Good
Value >= 40% and Value<50%	Satisfactory
Value <40%	Not Satisfactory

Level of PEO Attainment

Graduation Batch	Overall PEO Attainment (in percentage)	Whether Expected Level of PEO is Achieved? (Yes/No)

B. PROCESS OF REDEFINING THE PROGRMME EDUCATIONAL OBJECTIVES

The college has always been involving the keys take holders in collect in gin formationand suggestions with regard to curriculum development and curriculum revision. Based on the information collected the objectives of the Programme are defined, refined and are inscribed in the form of PEOs. The level of attainment of PEOs defined earlier will be analyzed and will identify the need for redefining PEOs. Based on identified changes in terms of curriculum, regulations and PEOs, the administrative system like Board of Studies, Academic Council and Governing Body may recommend appropriate actions. As per the Outcome Based Education Framework implemented from the Academic Year 2020 – 2021, the following are the Programme Structure, the Programme Contents and the Course Contents of B.Sc. Mathematics Programme.

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VIRUDHUNAGAR - 626 001

BACHELOROF SCIENCE MATHEMATICS (2014)

Outcome Based Education with Choice Based Credit System

Programme Structure-Allotment of Hours and Credits

ForThose who join in the Academic Year 2020-2021

Components	Semester						Total Number of Hours/ Credits
	I	II	III	IV	V	VI	
Part I : Tamil/Hindi	6(3)	6(3)	6(3)	6(3)	-	-	24(12)
Part II : English	6(3)	6(3)	6(3)	6(3)	-	-	24(12)
Part III : Core, Allied and DESC Courses:							
Core Course	4(4)	4(4)	3(3)	3(3)	5(4)	6(4)	25(22)
Core Course	4(4)	4(4)	4(3)	4(3)	5(4)	6(4)	27(22)
Core Course	-	-	-	-	5(4)	6(4)	11(8)
Core Course	-	-	-	-	4(4)	5(4)	9(8)
Core Course Practical	2(0)	2(2)	-	-	-	-	4(2)
DSEC	-	-	-	-	5(4)	5(4)	10(8)
Project	-	-	-	-	0(1)	-	0(1)
Allied Course	4(4)	4(4)	-	-		-	8(8)
Allied Course Practical	2(0)	2(2)	-	-	-	-	4(2)
Allied Course II	-	-	6(4)	4(4)	-	-	10(8)
Allied Course Practical	-	-		2(2)			2(2)
Self Study Courses	-	-	-	-		0(1)	0(1)
Part IV: Skill Enhancement Courses, Non Major Elective Courses, Ability Enhancement Compulsory Courses, Generic Elective Courses and Internship/ Field Project							
SEC	-	2(2)	2(2)	2(2)	2(2)	2(2)	10(10)
SEC	-	-	-	-	2(2)	-	2(2)
Non Major Elective	-	-	2(2)	2(2)	-	-	4(4)
AECC-Value Education	2 (2)	-	-	-	-	-	2 (2)
AECC-Environmental Studies	-	-	-	-	2 (1)	-	2 (1)
GEC	-	-	1(1)	-	-	-	1 (1)
GEC	-	-	-	1 (1)	-	-	1 (1)
Self Study Course					0(1)	-	0 (1)
Internship/ Field Project	-	-	-	0 (1)	-	-	0 (1)
Part V–Extension Activities	-	-	-	0(1)	-	-	0(1)
Total	**30 (20)**	**30 (24)**	**30 (21)**	**30 (25)**	**30 (27)**	**30 (23)**	**180 (140)**
Extra Credit Course	-	-	-	-	0(2)	-	0(2)

DSEC: Discipline Specific Elective Course; SEC– Skill Enhancement Course AECC-Ability Enhancement Compulsory Courses; GEC-Generic Elective Courses

PART I-TAMIL

S.No.	Sem.	Code	Title of the Course	Credits	Marks
1.	I	20UTAG11	பொதுத்தமிழ் தாள் I	3	100
2.	II	20UTAG21	பொதுத்தமிழ் தாள் II	3	100
3.	III	20UTAG31	பொதுத்தமிழ் தாள் III	3	100
4.	IV	20UTAG41	பொதுத்தமிழ் தாள் IV	3	100
	TOTAL			**12**	**400**

PART I-HINDI

S. No.	Sem.	Code	Title of the Course	Credits	Marks
1.	I	20UHDG11 22UHDG11	Hindi - Paper I Prose – I & II, Ancient Stories - I, General Essays, Functional Hindi – I & Grammar General Hindi – I	3	100
2.	II	20UHDG21 22UHDG21	Hindi - Paper II Drama, One Act Play, Letter, Correspondence, Functional Hindi – II & Grammar General Hindi – II	3	100
3.	III	20UHDG31 22UHDG31	Hindi - Paper III Ancient Poetry, Drama, Indian History, Hindi Grammar & Functional Hindi III Advanced Hindi – I	3	100
4.	IV	20UHDG41 22UHDG41	Hindi - Paper IV Modern Poetry, Hindi Literary Essays, Letter Correspondence, Conversation & Functional Hindi IV Advanced Hindi - II	3	100
	TOTAL			**12**	**400**

PART II-ENGLISH

S.No.	Sem.	Code	Title of the Course	Credits	Marks
1.	I		English – Paper I	3	100
		20UENG11A	English for Advanced Learners I		
		20UENG11B	English for Career Guidance - I		
		20UENG11C	English for Communicative Competence-I		

2.	II		English – Paper II	3	100
		20UENG21A	English for Advanced Learners II		
		20UENG21B	English for Career Guidance - II		
		20UENG21C	English for Communicative Competence - II		
3.	III		English – Paper III	3	100
		20UENG31A	English for Advanced Learners III		
		20UENG31B	English for Career Guidance – III		
		20UENG31C	English for Communicative Competence – III		
		22UENG31	Communicative English – I		
4.	IV		English – Paper IV	3	100
		20UENG41A	English for Advanced Learners IV		
		20UENG41B	English for Career Guidance – IV		
		20UENG41C	English for Communicative Competence – IV		
		22UENG41	Communicative English – II		
	TOTAL			**12**	**400**

PART III–CORE, DISCIPLINE SPECIFIC ELECTIVE COURSES

S.No.	Sem.	Code	Title of the Course	Credits	Marks
1	I	20UMTC11	Differential Calculus	4	100
2	I	20UMTC12/ 20UMTC12N	Theory of Equations	4	100
3	II	20UMTC21	Integral Calculus	4	100
4	II	20UMTC22/ 20UMTC22N	Analytical Geometry of Three Dimensions	4	100
5	II	20UMTC21P	Office Automation for MathematicsAnd DTP-Practical	2	100
6	III	20UMTC31	Statics	3	100
7	III	20UMTC32/ 20UMTC32N	Sequences and Series	3	100
8	IV	20UMTC41	Dynamics	3	100
9	IV	20UMTC42	Trigonometry and Vector Calculus	3	100
10	V	20UMTC51	Modern Algebra	4	100
11	V	20UMTC52	Real Analysis	4	100
12	V	20UMTC53	Numerical Methods	4	100
13	V	20UMTC54	Statistics–I	4	100
14	V	20UMTE51 20UMTE52 20UMTE53	Graph Theory with GRIN Automata Theory Mathematical Modelling	4	100

15	V	20UMTC5PR	Project	1	100
16	VI	20UMTC61	Linear Algebra with SCILAB	4	100
17	VI	20UMTC62	Complex Analysis	4	100
18	VI	20UMTC63	Differential Equations and its Applications using MATLAB	4	100
19	VI	20UMTC64	Statistics – II	4	100
20	VI	20UMTE61 20UMTE62 20UMTE63	Boolean Algebra and Lattices Optimization Techniques using MATLAB Astronomy	4	100
21	VI	20UMTQ61	Core Courses Quiz -Online	1	100
Total				**72**	**2100**

PART III –ALLIED COURSE I-PHYSICS

S.No.	Sem.	Code	Title of the Course	Credits	Marks
1	I	20UPMA11	Properties of Matter, Heat and Electricity	4	100
2	II	20UPMA21/ 20UPMA21N 20UPMA21P	Electromagnetism, Optics and Electronics General Physics	4 2	100 100
			Total	**10**	**300**

PART IV– SPECIFIC ELECTIVE COURSE -COMMERCE

S.No.	Sem.	Code	Title of the Course	Credits	Marks
1.	II	20UMTS21/ 20UMTS21N	Fundamentals of Accounting	2	100

PART III- ALLIED COURSE II- APPLIED MATHEMATICS

S.No.	Sem.	Code	Title of the Course	Credits	Marks
1.	III	20UAMA31/ 20UAMA31N	Operations Research	4	100
2.	IV IV	20UAMA41 20UAMA41P	Programming in C C- Practical	4 2	100 100
Total				**10**	**300**

PART IV- SKILL ENHANCEMENT COURSES

S.No.	Sem.	Code	Title of the Course	Credits	Marks
1.	II	20UMTS21	Fundamentals of Accounting	2	100
2.	III	20UMTS31P	MATLAB–Practical	2	100
3.	IV	20UMTS41	Integral Transforms	2	100
4.	V	20UMTS51	Summation of Series	2	100
5.	V	20UMTS52P	Numerical Methods using C	2	100
6.	VI	20UMTS61P	Statistics using R	2	100
Total				12	600

PART IV–NON MAJOR ELECTIVE COURSES

S.No.	Sem.	Code	Title of the Course	Credits	Marks
1.	III	20UMTN31	Quantitative Aptitude	2	100
2.	IV	20UMTN41	Statistics and Operations Research	2	100
			Total	**4**	**200**

PART IV- ABILITY ENHANCEMENT COMPULSORY COURSES, GENERIC ELECTIVE COURSES AND INTERNSHIP / FIELD PROJECT

S.No.	Sem.	Code	Title of the Course	Credits	Marks
1.	I	20UGVE11	Value Education	2	100
2.	V	20UGES51	Environmental Studies	1	100
3.	III	20UGEH31 20UGEW32	Human Rights/ Women Studies	1	100
4.	IV	20UGEC41	Constitution of India/	1	100
		20UGEM42	Modern Economics/		
		20UGEA43	Adolescent Psychology/		
		20UGED44	Disaster Management		
		20UMTI41G	Internship/Field Project	1	100
5.	V	20UGCE51	Practice for Competitive Examinations-Online	1	100
			Total	**7**	**600**

PART III–ALLIED COURSE I FOR PHYSICS & CHEMISTRY

S.No.	Sem.	Code	Title of the Course	Credits	Marks
1.	I	20UMTA11	Allied Mathematics I	4	100
2.	II	20UMTA21 20UMTA22	Allied Mathematics II Allied Mathematics III	3 3	100 100
			Total	**10**	**300**

PART III– ALLIED COURSE FOR COMPUTER SCIENCE

S.No.	Sem.	Code	Title of the Course	Credits	Marks
1.	I	20UCSA11	Numerical Methods	4	100
2.	II	20UCSA21	Probability and Statistics	4	100
3.	III	20UCSA31	Resource Management Techniques	4	100
4.	IV	20UCSA41	Quantitative Aptitude	4	100
			Total	**16**	**400**

PART IV– SPECIFIC ELECTIVE COURSE FOR COMMERCE

S. No.	Sem.	Code	Title of the Course	Credits	Marks
1.	IV	20UCOS41	Mathematics for Competitive Examinations	2	100

EXTRA CREDIT COURSE (Optional)

S.No.	Sem.	Code	Title of the Course	Credits	Total Marks
1.	V	20UMTO51	Arithmetic Ability (Internal Only)	2	100

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BACHELOROF MATHEMATICS

PROGRAMME CODE-2014

PROGRAMME CONTENT

SEMESTER I

Semester		Course Code	Courses	Hours per week	Credits	Exam Hours	Marks		
							Int.	Ext.	Total
I	Part I	20UTAG11/ 20UHDG11	Tamil/Hindi I	6	3	3	25	75	100
	Part II	20UENG11A/ 20UENG11B/ 20UENG11C	English I	6	3	3	25	75	100
	Part III	20UMTC11	**Core Course-1** Differential Calculus	4	4	3	25	75	100
		20UMTC12	**Core Course -2** Theory of Equations	4	4	3	25	75	100
		20UMTC21P	**Core Course -1** Core Practical Office Automation for Mathematics and DTP	2	-	3	-	-	100
		20UPMA11	**Allied Course–I** Properties of Matter, Heat and Electricity	4	4	3	25	75	100
		20UPMA21P	General Physics	2	-	3	-	-	
	Part IV	20UGVE11	Value Education	2	2	-	100	-	100
			TOTAL	**30**	**20**				**600**

B.SC Mathematics –SEMESTER II

Semester		Course Code	Courses	Hours per week	Credits	Exam Hours	Marks		
							Int.	Ext.	Total
II	Part I	20UTAG21/ 20UHDG21	Tamil/Hindi II	6	3	3	25	75	100
	Part II	20UENG21A/ 20UENG21B/ 20UENG21C	English II	6	3	3	25	75	100
	Part III	20UMTC21	**Core Course -3** Integral Calculus	4	4	3	25	75	100
		20UMTC22	**Core Course -4** Analytical Geometry of Three Dimensions	4	4	3	25	75	100
		20UMTC21P	**Core Course** Core Practical – I Office Automation for Mathematics and DTP	2	2	3	40	60	100
		20UPMA21 20UPMA21P	**Allied Course –I** Electromagnetism, Optics and Electronics General Physics	4 2	4 2	3 3	25 40	75 60	100 100
	Part IV	20UMTS21	**SEC -1** Fundamentals of Accounting	2	2	2	40	60	100
			TOTAL	**30**	**24**				**800**

B.SC Mathematics –SEMESTER III

Semester		Course Code	Courses	Hoursper week	Credits	Exam Hours	Marks		
							Int.	Ext.	Total
III	Part I	20UTAG31/ 20UHDG31	Tamil/Hindi III	6	3	3	25	75	100
	Part II	20UENG31A/ 20UENG31B/ 20UENG31C	English III	6	3	3	25	75	100
	Part III	20UMTC31	**Core Course -5** Statics	3	3	3	25	75	100
		20UMTC32	**Core Course -6** Sequences and Series	4	3	3	25	75	100
		20UAMA31	**Allied-Course -II** Operations Research	6	4	3	25	75	100
	Part IV	20UMTS31P	**SEC-2** MATLAB–Practical	2	2	2	40	60	100
		20UMTN31	**NMEC-1** Quantitative Aptitude	2	2	2	40	60	100
		20UGEH31 20UGEW32	**Generic Elective-1** 1.HumanRights 2.WomenStudies	1	1	2	100	-	100
			TOTAL	**30**	**21**				**800**

B.SC Mathematics –SEMESTER IV

Semester		Course Code	Course	Hours per week	Credits	Exam Hours	Marks		
							Int.	Ext.	Total
IV	Part I	20UTAG41/ 20UHDG41	Tamil/Hindi IV	6	3	3	25	75	100
	Part II	20UENG41A/ 20UENG41B/ 20UENG41C	English IV	6	3	3	25	75	100
	Part III	20UMTC41	**Core Course -7** Dynamics	3	3	3	25	75	100
		20UMTC42	**Core Course -8** Trigonometry and Vector Calculus	4	3	3	25	75	100
		20UAMA41 20UAMA41P	**Allied Course–II** Programming in C C- Practical	4 2	4 2	3 3	25 40	75 60	100 100
	Part IV	20UMTS41	**SEC-3** Integral Transforms	2	2	2	40	60	100
		20UMTN41	**NMEC-2** Statistics and Operations Research	2	2	2	40	60	100
		20UMTI41G	Internship/Field Project	0	1	-	100	-	100
			GenericElective-2	1	1	2	100	-	100
		20UGEC41	Constitution of India						
		20UGEM42	Modern Economics						
		20UGEA43	Adolescent Psychology						
		20UGED44	Disaster Management						
	Part V		Extension Activities	-	1		100		100
			TOTAL	**30**	**25**				**1100**

B.SC Mathematics –SEMESTER V

Semester		Course Code	Courses	Hours per week	Credits	Exam Hours	Marks		
							Int.	Ext.	Total
V	Part III	20UMTC51	**Core Course–9** Modern Algebra	5	4	3	25	75	100
		20UMTC52	**Core Course -10** Real Analysis	5	4	3	25	75	100
		20UMTC53	**Core Course–11** Numerical Methods	5	4	3	25	75	100
		20UMTC54	**Core Course–12** Statistics–I	4	4	3	25	75	100
		20UMTE51 20UMTE52 20UMTE53	**DSEC -1** 1.Graph Theory with GRIN 2.Automata Theory 3.Mathematical Modelling	5	4	3	25	75	100
	Part III	20UMTC5PR	**Core Course–13** PROJECT	-	1	3	100		100
	Part IV	20UMTS51	**SEC -4** Summation of Series	2	2	2	40	60	100
		20UMTS52P	**SEC -5** Numerical Methods using C	2	2	2	40	60	100
		20UGCE51	**Self Study Course** Practice for CompetitiveExaminations – Online	-	1	-	100		100
		20UGES51	Environmental Studies	2	1	2	100	-	100
			TOTAL	**30**	**27**				**900**

B.SC Mathematics –SEMESTER VI

Semester		Course Code	Courses	Hours per week	Credits	Exam Hours	Marks		
							Int.	Ext.	Total
VI	Part III	20UMTC61	**Core Course -14** Linear Algebra with SCILAB	6	4	3	25	75	100
		20UMTC62	**Core Course -15** Complex Analysis	6	4	3	25	75	100
		20UMTC63	**Core Course -16** Differential Equations and its Applications using MATLAB	6	4	3	25	75	100
		20UMTC64	**Core Course–17** Statistics– II	5	4	3	25	75	100
		20UMTE61 20UMTE62 20UMTE63	**DSEC -2** 1.Boolean Algebra and Lattices 2.Optimization techniques using MATLAB 3.Astronomy	5	4	3	25	75	100
		20UMTQ61	**Self Study Course** Core Courses Quiz –Online	-	1	2	100		100
	Part IV	20UMTS61P	**SEC-6** Statistics using R	2	2	2	40	60	100
			TOTAL	**30**	**23**				**700**

SEC - Skill Enhancement Course NMEC - Non–Major Elective Course

DSEC - Discipline Specific Elective Course

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VIRUDHUNAGAR - 626 001

BACHELOROF MATHEMATICS

PROGRAMME CODE-2014

Revised Programme Content

SEMESTER I

Semester		Course Code	Courses	Hours per week	Credits	Exam Hours	Marks		
							Int.	Ext.	Total
I	Part I	20UTAG11/ 20UHDG11	Tamil/Hindi I	6	3	3	25	75	100
	Part II	20UENG11A/ 20UENG11B/ 20UENG11C	English I	6	3	3	25	75	100
	Part III	20UMTC11	**Core Course-1** Differential Calculus	4	4	3	25	75	100
		20UMTC12N	**Core Course -2** Theory of Equations	4	4	3	25	75	100
		20UMTC21P	**Core Course -1** Core Practical Office Automation for Mathematics and DTP	2	-	3	-	-	100
		20UPMA11 20UPMA21P	**Allied Course–I** Properties of Matter, Heat and Electricity General Physics	4 2	4 -	3 3	25 -	75 -	100
	Part IV	20UGVE11	Value Education	2	2	-	100	-	100
			TOTAL	**30**	**20**				**600**

B.SC Mathematics –SEMESTER II

Semester		Course Code	Courses	Hours per week	Credits	Exam Hours	Marks		
							Int.	Ext.	Total
II	Part I	20UTAG21/ 20UHDG21	Tamil/Hindi II	6	3	3	25	75	100
	Part II	20UENG21A/ 20UENG21B/ 20UENG21C	English II	6	3	3	25	75	100
	Part III	20UMTC21	**Core Course -3** Integral Calculus	4	4	3	25	75	100
		20UMTC22N	**Core Course -4** Analytical Geometry of Three Dimensions	4	4	3	25	75	100
		20UMTC21P	**Core Course** Core Practical – I Office Automation for Mathematics and DTP	2	2	3	40	60	100
		20UPMA21	**Allied Course –I** Electromagnetism, Optics and Electronics	4	4	3	25	75	100
		20UPMA21P	General Physics	2	2	3	40	60	100
	Part IV	20UMTS21	**SEC -1** Fundamentals of Accounting	2	2	2	40	60	100
			TOTAL	**30**	**24**				**800**

B.SC Mathematics –SEMESTER III

Semester		Course Code	Courses	Hours per week	Credits	Exam Hours	Marks		
							Int.	Ext.	Total
III	Part I	20UTAG31/ 20UHDG31	Tamil/Hindi III	6	3	3	25	75	100
	Part II	20UENG31A/ 20UENG31B/ 20UENG31C	English III	6	3	3	25	75	100
	Part III	20UMTC31	**Core Course -5** Statics	3	3	3	25	75	100
		20UMTC32N	**Core Course -6** Sequences and Series	4	3	3	25	75	100
		20UAMA31N	**Allied-Course -II** Operations Research with Excel Solver	6	4	3	25	75	100
	Part IV	20UMTS31P	**SEC-2** MATLAB–Practical	2	2	2	40	60	100
		22UMTN31 22UMTN32	**NMEC-1** Quantitative Aptitude I **NMEC-2** Basic Statistics	2	2	2	40	60	100
		20UGEH31 20UGEW32	**Generic Elective-1** 1.HumanRights 2.WomenStudies	1	1	2	100	-	100
	TOTAL			**30**	**21**				**800**

B.SC Mathematics –SEMESTER IV

Semester		Course Code	Course	Hours per week	Credits	Exam Hours	Marks		
							Int.	Ext.	Total
IV	Part I	20UTAG41/ 20UHDG41	Tamil/Hindi IV	6	3	3	25	75	100
	Part II	20UENG41A/ 20UENG41B/ 20UENG41C	English IV	6	3	3	25	75	100
	Part III	20UMTC41	**Core Course -7** Dynamics	3	3	3	25	75	100
		20UMTC42	**Core Course -8** Trigonometry and Vector Calculus	4	3	3	25	75	100
		20UAMA41 20UAMA41P	**Allied Course–II** Programming in C C- Practical	4 2	4 2	3 3	25 40	75 60	100 100
	Part IV	20UMTS41	**SEC-3** Integral Transforms	2	2	2	40	60	100
		22UMTN41	**NMEC-3** Quantitative Aptitude II	2	2	2	40	60	100
		22UMTN42	**NMEC-4** Operations Research						
		20UMTI41G	Internship/Field Project	0	1	-	100	-	100
		20UGEC41 20UGEM42 20UGEA43 20UGED44	**Generic Elective-2** Constitution of India Modern Economics Adolescent Psychology Disaster Management	1	1	2	100	-	100
	Part V		Extension Activities	-	1		100		100
			TOTAL	**30**	**25**				**1100**

B.SC Mathematics –SEMESTER V

Semester		Course Code	Courses	Hours per week	Credits	Exam Hours	Marks		
							Int.	Ext.	Total
V	Part III	20UMTC51	**Core Course–9** Modern Algebra	5	4	3	25	75	100
		20UMTC52	**Core Course -10** Real Analysis	5	4	3	25	75	100
		20UMTC53	**Core Course–11** Numerical Methods	5	4	3	25	75	100
		20UMTC54	**Core Course–12** Statistics–I	4	4	3	25	75	100
		20UMTE51 20UMTE52 20UMTE53	**DSEC -1** 1.Graph Theory with GRIN 2.Automata Theory 3.Mathematical Modelling	5	4	3	25	75	100
	Part III	20UMTC5PR	**Core Course–13** PROJECT	-	1	3	100		100
	Part IV	20UMTS51	**SEC -4** Summation of Series	2	2	2	40	60	100
		20UMTS52P	**SEC -5** Numerical Methods using C	2	2	2	40	60	100
		20UGCE51	**Self Study Course** Practice for Competitive Examinations - Online	-	1	-	100		100
		20UGES51	Environmental Studies	2	1	2	100	-	100
			TOTAL	**30**	**27**				**900**

B.SC Mathematics –SEMESTER VI

Semester		Course Code	Courses	Hours per week	Credits	Exam Hours	Marks		
							Int.	Ext.	Total
VI	Part III	20UMTC61	**Core Course -14** Linear Algebra with SCILAB	6	4	3	25	75	100
		20UMTC62	**Core Course -15** Complex Analysis	6	4	3	25	75	100
		20UMTC63	**Core Course -16** Differential Equations and its Applications using MATLAB	6	4	3	25	75	100
		20UMTC64	**Core Course–17** Statistics– II	5	4	3	25	75	100
		20UMTE61 20UMTE62 20UMTE63	**DSEC -2** 1.Boolean Algebra and Lattices 2.Optimization techniques using MATLAB 3.Astronomy	5	4	3	25	75	100
		20UMTQ61	**Self Study Course** Core Courses Quiz -Online	-	1	2	100		100
	Part IV	20UMTS61P	**SEC-6** Statistics using R	2	2	2	40	60	100
TOTAL				**30**	**23**				**700**

SEC- Skill Enhancement Course NMEC - Non–Major Elective Course

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B.Sc. MATHEMATICS
(2020-21 onwards)

Semester I	**DIFFERENTIAL CALCULUS**	Hours/Week:4	
Core Course-1		Credits:4	
Course Code **20UMTC11**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: convey the fundamental concepts in differential calculus and its applications. [K1]

CO2: explain the concepts and method of finding tangent, normal, curvature, envelopes and asymptotes of a given curve. **[**K2]

CO3: find the p–r equations, polar sub tangent and polar subnormal of the curve. [K2]

CO4: apply the knowledge gained in calculus to find n^{th} derivative, maxima and minima, curvature, evolutes, asymptotes and p-r equation of given curves**.** [K3]

CO5: analyse the concept of Leibnitz's formula in finding n^{th} derivative of a function, curvature, evolutes, p-r equations and asymptotes of a curve. [K4]

UNIT I

Differentiation: Higher derivatives–n^{th} Derivative of some standard functions – Leibnitz's Theorem. (10 Hours)

UNIT II

Applications of Differentiation: Tangent, Normal, Sub tangent, Subnormal–Polar curves–Pedal Equation of a curve (p–r equation). (12 Hours)

UNIT III

Applications of Differentiation (Continued): Curvature: The length of an arc and its derivatives- Formula for radius of curvature – Formula for radius of curvature in p – r coordinates. Evolutes: Centre and circle of curvature – coordinates of the centre of curvature. (12 Hours)

UNIT IV

Applications of Differentiation (Continued): Envelopes: One parameter family of curve–Analytical method of finding envelopes. Maxima and Minima of functions of two variables: Working rule for finding maxima and minima of f(x,y).

(12 Hours)

UNIT V

Applications of Differentiation (Continued): Asymptotes: Methods of finding asymptotes for the curve y =f(x)- Asymptotes parallel to the y-axis – Asymptotes parallel to the x-axis–Inclined asymptotes (Oblique asymptotes)– Method of finding asymptotes for the curve f (x,y)=0-Asymptotes parallel to the axes for an algebraic curve f (x,y) = 0 of degree n (Asymptotes of polar curves–excluded). (14 Hours)

TEXTBOOK

Arumugam.S and Thangapandi Isaac.A. (2011). *Calculus,* New Gamma Publishing House.

Unit	Chapter	Section
I	Part–I - 2	2.11 to 2.13
II	Part–I - 3	3.1 to 3.3
III	Part–I - 3	3.4 and 3.5
IV	Part–I - 3	3.6,3.7
V	Part–I - 3	3.11 (page 219-250)

Course Code 20UMTC11	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	H	H	M	M	H	L	H	H	L	-
CO2	H	M	M	M	H	L	H	H	L	-
CO3	H	M	L	M	H	L	H	M	L	-
CO4	H	M	L	H	H	M	H	M	L	-
CO5	H	M	L	M	H	M	H	M	L	-

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B.Sc. MATHEMATICS

(2020-21onwards)

Semester I	**THEORY OF EQUATIONS**	Hours/Week:4	
Core Course-2		Credits:4	
Course Code		Internal	External
20UMTC12		25	75

COURSE OUTCOMES

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

CO1: communicate the relation between roots and coefficients of an equation. [K1]

CO2: explain the transformed equation whose roots are related to the roots of the given equation. [K2]

CO3: solve the polynomial equation with multiple roots. [K3]

CO4: identify the number of positive and negative real roots for any polynomial. [K3]

CO5: estimate the real roots of a cubic and biquadratic equation by Cardon's method and Ferrari's method. [K4]

UNIT I

Imaginary roots – Rational roots – Relation between the roots and coefficients. (10 Hours)

UNIT II

Symmetric functions of the roots –Sum of the powers of the roots of an equation - Newton's Theorem-Trans formations of equations – Roots with sign changed –Roots multiplied by a given number. (12 Hours)

UNIT III

Reciprocal roots – Reciprocal equation- To increase or decrease the roots of a given equation by a given quantity – Form of the quotient and remainder when a polynomial is divided by a binomial – Removal of terms–To form an equation whose roots are any power of the roots of a given equation. (12 Hours)

UNIT IV

Transformation in general - Descartes' rule of signs–Rolle's Theorem- Multiple roots. (13 Hours)

UNIT V

Horner's method - Cardon's method - Ferrari's method. (13 Hours)

TEXTBOOK

Manicavachagom Pillay.T.K.,Natarajan. T and Ganapathy.K.S. (2006). *Algebra Volume I,* S.Viswanathan (Printers & Publishers) Pvt.Ltd.

Unit	Chapter	Sections
I	6	1to11
II	6	12to15.2
III	6	15.3,16 to 20
IV	6	21,24 to 26
V	6	30,30.1,34.1(i),35

Course Code 20UMTC12	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	H	H	M	M	H	M	M	L	L	-
CO2	H	H	M	M	H	M	M	L	L	-
CO3	H	H	M	M	H	M	M	L	L	-
CO4	H	H	M	M	H	M	M	L	L	-
CO5	H	H	M	M	H	M	M	L	L	-

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B.Sc. MATHEMATICS

(2023-24onwards)

Semester I	**THEORY OF EQUATIONS**	Hours/Week:4	
CoreCourse-2		Credits:4	
Course Code		Internal	External
20UMTC12N		25	75

COURSE OUTCOMES

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

CO1: communicate the relation between roots and coefficients of an equation. [K1]

CO2: explain the transformed equation whose roots are related to the roots of the given equation. [K2]

CO3: solve the polynomial equation with multiple roots. [K3]

CO4: identify the number of positive and negative real roots for any polynomial. [K3]

CO5: estimate the real roots of a cubic and biquadratic equation by Strum's Theorem and Cardon's method [K4]

UNITI

Imaginary roots – Rational roots – Relation between the roots and coefficients. (10 Hours)

UNIT II

Symmetric functions of the roots –Sum of the powers of the roots of an equation - Newton's Theorem-Trans formations of equations – Roots with sign changed –Roots multiplied by a given number. (12 Hours)

UNIT III

Reciprocal roots – Reciprocal equation- To increase or decrease the roots of a given equation by a given quantity – Form of the quotient and remainder when a polynomial is divided by a binomial – Removal of terms–To form an equation whose roots are any power of the roots of a given equation. (12 Hours)

UNIT IV

Transformation in general - Descartes' rule of signs–Rolle's Theorem- Multiple roots. (13 Hours)

UNITV

Strum's Theorem-Horner's method - Cardon's method. (13 Hours)

TEXTBOOK

Manicavachagom Pillay.T.K.,Natarajan. T and Ganapathy.K.S. (2006). *Algebra Volume I*, S.Viswanathan (Printers & Publishers) Pvt.Ltd.

Unit	Chapter	Sections
I	6	1 to 11
II	6	12 to 15.2
III	6	15.3,16 to 20
IV	6	21,24 to 26
V	6	30, 30.1, 34.1(i), 35

REFERENCE BOOKS:

1. Arumugam. S and Thangapandi Isaac.A(2011), *Algebra*: Theory of Equations, Theory of Numbers and Trigonometry, (Revised Edition) New Gamma Publishing House.

2. Vittal. P.R and Malini. V (2014), *Algebra ,Analytical Geometry*, Third Edition 2000, Reprint 2014, Margham Publications, Chennai-17.

Course Code 20UMTC12N	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	H	H	M	M	H	M	M	L	L	-
CO2	H	H	M	M	H	M	M	L	L	-
CO3	H	H	M	M	H	M	M	L	L	-
CO4	H	H	M	M	H	M	M	L	L	-
CO5	H	H	M	M	H	M	M	L	L	-

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B.Sc. MATHEMATICS
(2020 - 2021onwards)

Semester I	**Properties of Matter, Heat and Electricity**	Hours/Week: 4	
Allied Course I		Credits: 4	
Course Code **20UPMA11**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: explain the basic laws, concepts in gravitation, properties of matter, relativity, electricity and heat. [K1]

CO2: derive mathematical relations involved in gravitation, properties of matter, relativity, heat, static and current electricity by applying the relevant concepts. [K2]

CO3: discuss the experimental methods to determine the physical parameters related to gravitation, relativity, properties of matter and heat. [K2]

CO4: illustrate the applications of relativistic variation, properties of matter, heat and electricity. [K3]

CO5: analyze the different moduli of elasticity, molecular theory of surface tension, acceleration due to gravity at different places and relativistic variation of length, time and mass with velocity. [K4]

UNIT I

Gravitation - Kepler's Law of planetary motion - Newton's law of gravitation - mass & density of earth - Determination of 'G' by Boy's method - Variation of 'g' with latitude, altitude and depth –Relativity - Theory of relativity - Lorentz transformation - Postulates of special theory of relativity – Michelson Morley experiment - Length contraction - Time dilation – variation of mass with velocity - mass Energy equivalence.

(12 Hours)

UNIT II

Elasticity - Different Moduli of elasticity - Poisson's ratio - Bending of beams - Expression for the bending moment - Determination of Young's modulus by uniform

bending - Determination of Young's modulus by non-uniform bending - Torsion of a cylinder - Expression for couple per unit twist - Work done in twisting - Torsional oscillations of a body -Determination of Rigidity modulus by Torsion pendulum.

(12 Hours)

UNIT III

Viscosity - Streamline flow and turbulent flow – Co-efficient of viscosity - Derivation of Poiseuille's formula - Terminal Velocity - Stokes' Law - Determination of 'η' of a highly viscous liquid - lubrication -Surface Tension: Molecular theory of Surface Tension - excess pressure inside a liquid drop - excess pressure inside a soap bubble– Jaegar's method – Variation of surface tension with temperature**.** (12 Hours)

UNIT IV

Entropy - change of entropy in a Carnot's cycle - Change of entropy in conversion of ice into steam- Radiation - Stefan's law - Determination of Stefan's constant by filament heating method –Solar constant – Water flow pyrheliometer – Temperature of the sun –Temperature of the sun using Wien's displacement law – Solar spectrum - Energy distribution in black body spectrum - Statement of Planck's law of radiation - Wien's law - Rayleigh-Jeans law. (12 Hours)

UNIT V

Electrostatics - Coulomb's law - Gauss law - Application of Gauss law at a point outside the charged sphere - Capacitor - principle of a capacitor -capacitance of parallel plate capacitor - Energy stored in a charged capacitor - Loss of energy on sharing of charges between two capacitors -Current Electricity - Kirchhoff's laws - Application of Kirchhoff's law to Wheatstone network - Carey-Foster's bridge - Determination of temperature co-efficient of resistance -Potentiometer - Calibration of ammeter - Calibration of voltmeter (Low range). (12 Hours)

TEXT BOOK

Murugeshan, R. (2014). *Allied Physics*,New Delhi: SultanChand &Company Private Ltd.

REFERENCE BOOKS

1. Brijlal, N, Subramaniyan and Hemne, P.S. (2014). *Heat, Thermodynamics and Statistical Physics*, New Delhi: Sultan Chand & Company Private Ltd.
2. Ubald Raj, A., and Jose Robin, G. (2016). *Allied Physics–I*, Marthandam: Indira Publications.

Course Code 20UPMA11	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	H	M	L	-	-	-	M
CO2	H	H	H	L	-	-	-
CO3	H	M	M	M	-	-	-
CO4	H	H	H	M	-	L	-
CO5	H	M	M	M	H	-	-

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B.Sc. MATHEMATICS
(2020-21onwards)

Semester II	**INTEGRAL CALCULUS**	Hours/Week:4	
CoreCourse-3		Credits:4	
Course Code **20UMTC21**		Internal 25	External 75

COURSEOUTCOMES

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

CO1: list the various properties of proper and improper integrals. [K1]

CO2: explain the properties of various integrals, Beta and Gamma functions and their applications. [K2]

CO3: determine the given integrals, Fourier series for a given function and solve problems using its applications. [K3]

CO4: apply integration techniques and Fourier series in higher mathematics. [K3]

CO5: analyze the application of integration in real life problems. [K4]

UNIT I

Evaluation of Integrals: Integration by parts. **Reduction formulae:** Reduction formula for $\int x^n \cos axdx$, $\int \sin^n xdx$, $\int \cos^n xdx$, $\int \tan^n xdx$, $\int \sec^n xdx$, $\int \cos ec^n xdx$, $\int \cot^n xdx$, $\int \sin^m x \cos^n xdx$, $\int_0^{\pi/2} \sin^m xcon^n xdx$, solved problems (12 Hours)

UNIT II

Multiple Integrals: Double Integrals–Evaluation of Double Integrals. Triple Integrals (12 Hours)

UNIT III

Beta and Gamma Functions: Beta and Gamma functions. **Fourier series**: Definition - The cosine and sine series. (12 Hours)

UNIT IV

Centre of mass: Definition and Solved Problems (12 Hours)

UNIT V

Moment of inertia: Definition- Parallel axis theorem- Perpendicular axis theorem and solved problems (12 Hours)

TEXTBOOKS

1. Arumugam.S.and Thangapandi Isaac.A.(2011). *Calculus*, New Gamma Publishing House.

2. Arumugam.S .(1983). *Advanced Calculus (Volume II),* New Gamma Publishing House.

Unit	Chapter	Section
Text Book1		
I	Part–II 2	2.7,2.8
II	Part–II 3	3.1 , 3.2, 3.3
III	4	4.0, 4.1
	5	Full
Text Book2		
IV	Chapter 6	6.7
V	Chapter 6	6.8

Course Code 20UMTC21	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	H	H	H	H	M	H	H	L	-	
CO2	H	H	H	H	H	M	H	L	L	-
CO3	H	H	H	H	H	M	M	L	L	-
CO4	H	H	M	M	H	H	M	L	L	-
CO5	H	M	M	H	M	M	H	L	L	-

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B.Sc. MATHEMATICS

(2020-21onwards)

Semester II	**ANALYTICAL GEOMETRY OF THREE DIMENSIONS**	Hours/Week:4	
Core Course-5		Credits:4	
Course Code **20UMTC22**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: list the different forms of equations of planes, straight lines, sphere and cone. [K1]

CO2: explain the basic concept of straight lines, planes, plane and line, angle between two planes, sphere and cone. [K2]

CO3: describe the properties of straight lines, planes, plane and line, sphere and cone. [K2]

CO4: apply the appropriate formulae to solve problems in straight lines, planes, sphere and cone. [K3]

CO5: analyze different forms of equations of straight lines, planes, sphere and cone. [K4]

UNIT I

Planes: Equation of a plane - Angle between two planes – Angle bisectors of two planes. (10 Hours)

UNIT II

Straight lines: Equation of a straight line – non -symmetric form – symmetric form – two points form (13 Hours)

UNIT III

Straight lines Continued: A plane and a line - Skew lines. (13 Hours)

UNIT IV

The sphere: Equation of a sphere – Tangent line and Tangent plane – Section of a sphere. (13 Hours)

UNIT V

Cone: Cone – Right Circular cone – intersection of a straight line and a quadric cone– tangent plane and normal–condition for the plane to touch the quadric cone.

(11 Hours)

TEXTBOOK

1. Arumugam.S. and Thangapandi Isaac.A.(2014). *Analytical geometry 3D and Vector Calculus*, New Gamma Publishing House.
2. Manicavachagom Pillay.T.K. and Natarajan.T. (2006). *A text book of Analytical Geometry Part II – Three Dimensions*, S. Viswanathan (Printers & Publishers) Pvt. Ltd.

Unit	Chapter	Section
Text Book 1		
I	2	2.1, 2.2, 2.3
II	3	3.1
III	3	3.2
IV	4	4.1, 4.2, 4.3
Text Book 2		
V	5	2,2.1, 3,4,5

Course Code 20UMTC22	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	H	H	M	M	H	M	M	L	L	-
CO2	H	M	M	L	M	L	L	L	M	-
CO3	H	M	M	L	M	L	L	L	M	-
CO4	H	M	L	L	H	L	L	L	M	-
CO5	H	M	M	L	H	L	L	L	L	-

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B.Sc. MATHEMATICS

(2022-23onwards)

Semester II	**ANALYTICAL GEOMETRY OF THREE DIMENSIONS**	Hours/Week:4	
Core Course-5		Credits:4	
Course Code **20UMTC22N**		Internal 25	External 75

COURSEOUTCOMES

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

CO1: list the different forms of equations of planes, straight lines, sphere and cone. [K1]

CO2: explain the basic concept of straight lines, planes, plane and line, angle between two planes, sphere and cone. [K2]

CO3: describe the properties of straight lines, planes, plane and line, sphere and cone. [K2]

CO4: apply the appropriate formulae to solve problems in straight lines, planes, sphere and cone. [K3]

CO5: analyze different forms of equations of straight lines, planes, sphere and cone. [K4]

UNIT I

Planes: Equation of a plane - Angle between two planes – Angle bisectors of two planes. (10 Hours)

UNIT II

Straight lines: Equation of a straight line – non -symmetric form – symmetric form – two points form (13 Hours)

UNIT III

Straight lines Continued: A plane and a line - Skew lines. (13 Hours)

UNIT IV

The sphere: Equation of a sphere – Tangent line and Tangent plane – Section of a sphere. (13 Hours)

UNIT V

Cone: The equation of a surface - Equation of a cone - Homogeneous function - Quadratic cone with vertex at the origin - Enveloping cone -Tangent plane and normal - Reciprocal cone. (11 Hours)

TEXTBOOK

1. Arumugam.S. and Thangapandi Isaac.A.(2014). *Analytical geometry 3D and Vector Calculus,* New Gamma Publishing House.
2. Venkatachalapathy.S.G. (2010). *Analytical Geometry(2 Dimensions & 3 Dimensions)* Margham Publications

Unit	Chapter	Section
Text Book 1		
I	2	2.1, 2.2, 2.3
II	3	3.1
III	3	3.2
IV	4	4.1, 4.2, 4.3
Text Book 2		
V	10	10.1 – 10.24

REFERENCE BOOKS

1. Manickavachagom Pillay.T.K, Natarajan.T (1987), *A text book of Analytical Geometry (Part II – Three Dimensions)*, S.Viswanathan (Printers & Publishers) Pvt. Ltd.
2. Duraipandian, P, Laxmi Duraipandian & Muhilan. D, *Analytical Geometry 3 Dimensional*, (1995), Emerald Publishers, Madras.

Course Code 20UMTC22N	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	H	H	M	M	H	M	M	L	L	-
CO2	H	M	M	L	M	L	L	L	M	-
CO3	H	M	M	L	M	L	L	L	M	-
CO4	H	M	L	L	H	L	L	L	M	-
CO5	H	M	M	L	H	L	L	L	L	-

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B.Sc. MATHMATICS
(2020 - 2021 onwards)

Semester II	**Electromagnetism, Optics and Electronics**	Hours/Week: 4	
Allied Course I		Credits: 4	
Course Code **20UPMA21**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: explain the fundamentals aspects of electromagnetism, optics, analog and digital electronics. [K1]

CO2: derive mathematical relations as well as the experimental concepts related to electromagnetism, geometrical and physical optics. [K2]

CO3: discuss the construction, working principle of electronic components also interpret the Boolean equations with number system & Boolean algebra. [K2]

CO4: apply the related concepts to solve the problems in electromagnetism, optics and basic electronics. [K3]

CO5: compile the applications of electromagnetism, optics, amplifiers and number Systems. [K4]

UNIT I

Electromagnetism -Torque on a current loop in a uniform magnetic field - D'Arsonval moving coil Galvanometer (Mirror galvanometer) - Current and voltage sensitiveness of a moving coil galvanometer -Moving coil Ballistic Galvanometer - Comparison of emf's of two cells using B.G - Alternating Current - Average and rms value - Series resonance circuit – Parallel resonance circuit – Comparison between series and parallel resonant circuits - Power in an a.c circuit containing inductance, capacitance and resistance - Wattless current - Choke coil**.** (12 Hours)

UNIT II

Optics – Refraction through thin lens - Aberration in lenses –Chromatic aberration Condition for achromatism of two thin lenses are in contact and separated by a distance –Spherical aberration – Methods of spherical aberration in lenses - Refraction

through a prism - Expression for the dispersive power of the material of a thin prism - Achromatism in prism – Deviation without dispersion – Dispersion without deviation – Direct vision spectroscope – Interference- Interference in thin films - Air wedge – Diffraction-Plane transmission diffraction grating -Determination of wavelength of light using transmission grating -Polarisation of light – Double refraction - Nicol prism – Quarter and Half wave plate. (12 Hours)

UNIT III

The p-n junction diode action– Experiment to study the volt-ampere characteristics of a p-n junction diode - Zener diode -I-V characteristics of Zener diode –Power supply – Zener diode as voltage regulator – Junction transistor - Transistor action–Relation connecting α and β of a transistor – Transistor characteristics in the common emitter mode – Methods of transistor biasing: Fixed bias or base bias circuit, Voltage divider bias - Transistor amplifier–Transistor as active device - Common emitter transistor amplifier – Frequency response of transistor amplifier. (12 Hours)

UNIT IV

Modulation – The need for modulation - Types of modulation – Amplitude modulation: Waveform, side bands and power – Demodulation - Limitations of amplitude modulation. Operational amplifiers – Characteristics of an op-amp – The slew rate – Virtual earth – inverting amplifier – Non-inverting amplifier – Summing amplifier – Difference amplifier - Op-amp as integrator – Op-amp as differentiator – Solving differential using op-amp. (12 Hours)

UNIT V

Number Systems –Hexadecimal numbers – Hexadecimal to binary conversion – Binary to hexadecimal conversion – Codes – excess -3 codes – Binary Coded decimals (BCD) – Gray code – Conversion of a binary number to gray code - Conversion from gray code to binary. Digital circuits – Boolean equations of Logic circuits - Boolean algebra – Boolean postulates – De- Morgan's Laws – Implementing the basic logic gates using NAND gates & NOR gates. (12 Hours)

TEXT BOOK

Study Material

REFERENCE BOOKS

1. R.Murugeshan, R. (2014), *Allied Physics*, New Delhi: Sultan Chand &Company Private Ltd.
2. Brijlal., and Subramaniam, N. (2013). *Text book of Optics*, New Delhi: Sultan Chand & Company Pvt.Ltd.
3. Jose Robin, G., and Ubald Raj, A. (2014). *Digital Electronics*, Marthandam: Indira Publications.
4. Jose Robin, G., and Ubald Raj, A. (2014). *Basic Electronics*, Marthandam: Indira Publications.

Course Code 20UPMA21	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	H	M	L	-	-	-	M
CO2	H	H	H	L	-	-	-
CO3	H	M	M	M	-	-	-
CO4	H	H	H	M	-	L	-
CO5	H	M	M	M	H	-	-

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B.Sc. MATHEMATICS
(2022 - 2023 onwards)

Semester II	**ELECTROMAGNETISM, OPTICS AND ELECTRONICS**	**Hours/Week: 4**	
Allied Course- 2		**Credits: 4**	
Course Code 20UPMA21N		**Internal** 25	**External** 75

COURSE OUTCOME

On successful completion of the course, the learners should be able to

CO1: explain the fundamentals aspects of electromagnetism, optics, electronics [K1]

CO2: derive mathematical expressions related to electromagnetism, geometrical and physical optics [K2]

CO3: illustrate the experimental aspects of electromagnetism, optics, and electronics [K2]

CO4: apply the learned concepts to find physical parameters related to electromagnetism, optics, electronics. [K3]

CO5: analyze the factors influencing magnetic field in current carrying conductors, resonant frequency, interference & diffraction, transistor action and simplification of logical circuits.[K4]

UNIT I

Magnetostatics: Introduction – Biot–Savart law – magnetic induction at point due to a straight conductor carrying current – magnetic field at the centre of a circular coil carrying current–magnetic induction at a point on the axis of a circular coil carrying current ampere's circuital law – applications of amperes law – force on a current carrying conductor in a magnetic field (12 Hours)

UNIT II

Electromagnetism : Torque on a current loop in a uniform magnetic field – Current and voltage sensitiveness of a moving coil galvanometer – Moving coil Ballistic Galvanometer – Comparison of emf of two cells using B.G – Alternating Current – Average and rms value – Series resonance circuit – Parallel resonance circuit

– Comparison between series and parallel resonant circuits – Power in an a.c circuit containing inductance, capacitance and resistance – Wattless current – Choke coil**.**

(12 Hours)

UNIT III

Optics: Refraction through thin lens – Aberration in lenses –Chromatic aberration Condition for achromatism of two thin lenses are in contact and separated by a distance –Spherical aberration – Methods of spherical aberration in lenses – Refraction through a prism – Expression for the dispersive power of the material of a thin prism – Achromatism in prism – Deviation without dispersion – Dispersion without deviation – Direct vision spectroscope

Interference– Interference in thin films – Air wedge – Diffraction–Plane transmission diffraction grating –Determination of wavelength of light using transmission grating. (12 Hours)

UNIT IV

Analog Electronics: The p–n junction diode action– Experiment to study the volt–ampere characteristics of a p–n junction diode – Zener diode –I–V characteristics of Zener diode –Power supply – Zener diode as voltage regulator – Junction transistor – Transistor action – Relation connecting α and β of a transistor – Transistor characteristics in the common emitter mode – Methods of transistor biasing: Fixed bias or base bias circuit, Voltage divider bias – Transistor amplifier–Transistor as active device. (12 Hours)

UNIT V

Digital Electronics: Number Systems –Hexadecimal numbers – Hexadecimal to binary conversion – Binary to hexadecimal conversion – Codes – excess –3 codes – Binary Coded decimals (BCD) – Gray code – Conversion of a binary number to gray code – Conversion from gray code to binary.

Digital circuits – Boolean equations of Logic circuits – Boolean algebra – Boolean postulates – De–Morgan's Laws – Implementing the basic logic gates using NAND gates & NOR gates. (12 Hours)

TEXT BOOK

1. R.Murugeshan, R, (2017), *Electricity and magnetism*, New Delhi. Sultan Chand & Company Private Ltd.
2. R.Murugeshan, R, (2014), *Electricity and Electronics*, New Delhi. Sultan Chand & Company Private Ltd
3. R.Murugeshan, R, (2013), *Optics and Spectroscopy*, New Delhi. Sultan Chand & Company Private Ltd.

PO/CO	**PO1**		**PO2**	**PO3**		**PO4**		**PO5**	**PO6**	**PO7**
Course Code 20UPMA21N	**PSO 1a**	**PSO 1b**	**PSO 2**	**PSO 3a**	**PSO 3b**	**PSO 4a**	**PSO 4b**	**PSO 5**	**PSO 6**	**PSO 7**
CO 1	M	M	H	–	–	L	L	–	–	M
CO 2	M	H	L	M	M	M	M	–	–	–
CO 3	L	M	M	M	M	L	L	–	–	–
CO 4	M	H	L	H	H	M	M	–	–	–
CO 5	M	H	L	H	H	H	M	H	–	–

REFERENCE BOOKS

1. R.Murugeshan, R, (2014), *Allied Physics*, New Delhi. Sultan Chand &Company Private Ltd.
2. Brijlal and Subramaniam, N. (2013).*Text book of Optics*, New Delhi: Sultan Chand & Company Pvt.Ltd.

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B.Sc. MATHEMATICS
(2020 - 2021 onwards)

Semester I/II	**GENERAL PHYSICS**	Hours/Week: 2	
Allied Course I Practical		Credits: 2	
Course Code 20UPMA21P		Internal 40	External 60

COURSE OUTCOMES

On completion of the practical, the students will be able to

CO1: apply the theoretical concepts in Mechanics and Properties of matter, Optics and Electronics related experiments. [K3]

CO2: draw the circuit diagram /experimental set up with tabular column/model graph and write the formula to calculate the required physical parameters. [K3]

CO3: execute the technical skills in handling the equipment and observe the required measurements related to the experiment. [K3]

CO4: calculate the necessary parameters using the formula/graph and complete the record work. [K3]

CO5: analyze the accuracy of the results obtained and compare it with the theoretical value. [K4]

List of Experiments:

1. Young's modulus by uniform bending - pin and microscope
2. Torsion pendulum - determination of G
3. Calibration of voltmeter (low range) - Potentiometer
4. Resistance and resistivity - Potentiometer
5. Co-efficient of viscosity - Stoke's method
6. Air wedge - Thickness of a wire
7. Spectrometer – wavelength of light
8. L.C.R. - Series resonance - determination of resonance frequency &L
9. Mirror galvanometer - voltage and current sensitiveness
10. Zener diode characteristics

11. Summing amplifier using op-amp
12. Integrator & Differentiator using op-amp
13. Verification of Basic gates using Universal gates
14. Solving Boolean equation using Logic gates

Course Code 20UPMA21P	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	H	L	H	L	-	-	M
CO2	H	H	H	M	-	-	L
CO3	H	H	H	M	L	H	-
CO4	H	H	H	M	L	M	H
CO5	M	M	M	H	M	M	H

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B.Sc. MATHEMATICS

(2020-21onwards)

Semester II	**FUNDAMENTALS OF ACCOUNTING**	Hours/Week:2	
SEC		Credits:2	
Course Code **20UMTS21**		Internal 40	External 60

COURSE OUTCOMES

On completion of this course, the students will be able to

CO1: identify and be familiar with the classification of accounts and accounting terminology. [K1]

CO2: describe the rules of accounting and accounting process. [K2]

CO3: apply the rules for journalising, preparing day book and balancing the accounts. [K3]

CO4: prepare the final accounts. [K4]

CO5: integrate the trial balance and balance sheet. [K4]

UNIT I

Accounting – Definition – Meaning – Book – keeping – Accounting Vs Book – keeping –Account – Types – Rules– Double entry and single entry systems – Differences. (7 Hours)

UNIT II

Journal – Meaning –Narration–Uses–Ledger–Meaning–Uses–Journal Vs Ledger. (5 Hours)

UNIT III

Subsidiary books–Sales, Purchases and CashBook (Single Column only)–Trial Balance (5 Hours)

UNIT IV

Final Accounts – Trading Account – Profit and Loss Account – Format –Meaning – Uses – Differences (Simple Problems only (6 Hours)

UNIT V

Balance Sheet –Meaning – Format –Uses – Difference between Balance Sheet and Trial Balance (Problems with adjustments related to Stock, Returns, Accruals, Out standings and Prepaid only) (7 Hours)

NOTE:

Composition of the Question Paper: Theory : 40%

Problems : 60%

TEXT BOOK

Nagarajan,K.L., Vinayakam,N.andMani,P.L.(2006).*Principles of Accountancy*, New Delhi: Eurasla Publishing House Pvt.Ltd.-Chapters1,2,3,4&6.

REFERENCE BOOKS

1. Arulanandam, M.A.and Raman,K.S.(2005).*Advanced Accountancy*, New Delhi: Himalaya Publishing House.
2. Gupta, R.L. and Radhaswamy,M.(2007).*Advanced Accountancy*, New Delhi: Sultan Chand & Sons

Course Code 20UMTS21	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	H	H	-	-	-	-	-
CO2	H	H	-	-	-	-	L
CO3	H	H	L	L	-	-	L
CO4	H	H	L	L	-	-	L
CO5	H	H	L	L	-	L	L

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B.Sc. MATHEMATICS
(2020-21onwards)

Semester II	**FUNDAMENTALS OF ACCOUNTING**	Hours/Week: 2	
Skill Enhancement Course		Credits: 2	
Course Code		Internal	External
20UMTS21N		40	60

COURSE OUTCOMES

On completion of this course, the students will be able to

CO1: identify the accounting terminology and the purpose of preparing accounts. [K1]

CO2: explain the types, rules and format of statements and accounts. [K2]

CO3: use the process of accounts for preparing the books of accounts. [K3]

CO4: distinguish between accounting and book-keeping, journal and Ledger and trial balance and balance sheet. [K4]

CO5: summarise the books of accounts and integrate the trial balance and balance sheet. [K4]

UNIT I

Accounting: Meaning – Definition – Book-keeping – Accounting Vs. Book-keeping – Account – Accounting Terms - Types – Rules – Double Entry and Single Entry Systems – Differences. (7 Hours)

UNIT II

Journal: Meaning – Journalising - Narration –Ledger – Meaning – Purpose – Journal vs. Ledger. (5 Hours)

UNIT III

Subsidiary Books: Meaning – Purchase, Sales and Cash Book (Single Column only) – Trial Balance – Meaning – Principles. (5 Hours)

UNIT IV

Final Accounts: Meaning – Purpose – Preparation of Trading Account – Profit and Loss Account. (Simple Problems only) (6 Hours)

UNIT V

Balance Sheet: Meaning – Purpose – Difference between Balance Sheet and Trial Balance (Problems with adjustments related to Closing Stock only) (7 Hours)

SELF STUDY FOR ASSINGNMENT

1. Accounting Concepts.
2. Trade Discount vs. Cash Discount.

NOTE: Composition of the Question Paper:

Theory	:	40 %
Problems	:	60 %

TEXT BOOK

Nagarajan, K.L., Vinayakam, N., and Mani, P.L. (2013). *Principles of Accountancy*, New Delhi: Eurasia Publishing House Pvt. Ltd., 4th Edition.

REFERENCE BOOKS

1.Arulanandam, M.A., and Raman, K.S. (2019). *Advanced Accountancy*, New Delhi: Himalaya Publishing House.

2.Gupta, R.L. and Radhaswamy, M. (2014). *Advanced Accountancy*, New Delhi: Sultan Chand & Sons.

3.Reddy, T.S., and Murthy. A. (2012). *Financial Accounting*, Chennai: Margham Publications, 6th Revised Edition, Reprint 2018.

Course Code 20UMTS21N	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	H	H	-	-	-	-	-
CO2	H	H	-	-	-	-	L
CO3	H	H	L	L	-	-	L
CO4	H	H	L	L	-	-	L
CO5	H	H	L	L	-	L	L

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B.Sc. MATHEMATICS
(2020-21onwards)

Semester III	**STATICS**	Hours/Week:3	
Core Course-5		Credits:3	
Course Code **20UMTC31**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: explain the basic concepts in finding the resultant of any number of forces acting at a point, resolution of a force, equilibrium of forces, parallel forces, and moments. [K1]

CO2: derive expressions for the resultant of any number of forces acting at a point, parallel forces, the moment of a force about an axis. [K2]

CO3: apply various laws of forces in solving problems. [K3]

CO4: analyze the techniques to solve static problems in real-life situations. [K4]

CO5: evaluate the resultant of any number of forces acting at a point, like and unlike parallel forces, condition for the equilibrium of forces, the moment of a force. [K5]

UNIT I

Forces acting at a point

Resultant and components: Definition- Simple cases of finding the resultant – Parallelogram of Forces-Analytical expression for the resultant of two forces acting at a point – Triangle of Forces- Perpendicular Triangle of Forces- Converse of the Triangle of forces – The Polygon of Forces - Lami's Theorem– An extended form of the parallelogram law of forces. (9 Hours)

UNIT II

Forces acting at a point

Resolution of a force- Components of a force a long two given directions – Theorem on Resolved Parts- Resultant of any number of forces acting at a point: Graphical method –

Resultant of any number of coplanar forces acting at a point: Analytical method-Conditions of equilibrium of any number of forces acting upon a particle.

Parallel Forces and Moments

Introduction: To find the resultant of two like parallel forces acting on a rigid body-To find the resultant of two unlike and unequal parallel forces acting on a rigid body-Resultant of a number of parallel forces acting on a rigid body. (9 Hours)

UNIT III

Parallel Forces and Moments

Condition of equilibrium of three coplanar parallel forces – Centre of two parallel forces-Moment of a force– Physical significance of moment of a force-Geometrical Representation of a moment – Sign of the moment – Unit of moment - Varigon's Theorem of Moments. (8 Hours)

UNIT IV

Parallel Forces and Moments

Generalised theorem of moments (Principle of Moments) – Moment of a force about an axis.

Equilibrium of Three Forces Acting on A Rigid Body

Rigid body subjected to any three forces – Three Coplanar Forces - Conditions of Equilibrium – Procedure to be followed in solving any statical problem. (10 Hours)

UNIT V

Equilibrium of Three Forces Acting on A Rigid Body

Two trigonometrical theorems - Some artifices – Problems on parallel forces

(9 Hours)

TEXTBOOK

Venkataraman M.K. (July2013). *Statics*, Agasthiar Publications.

Unit	Chapter	Sections
I	2	1-10
II	2 3	11-16 1-4
III	3	5-12
IV	3 5	13,14 1-4
V	5	5-7

Course Code 20UMTC31	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	H	H	H	H	H	M	H	M	H	-
CO2	H	H	H	H	H	M	H	M	H	-
CO3	H	H	H	H	H	M	H	M	H	-
CO4	H	H	H	H	H	M	H	M	H	-
CO5	H	H	H	H	H	M	H	M	H	-

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B.Sc. MATHEMATICS
(2020-21onwards)

Semester III	**SEQUENCES AND SERIES**	Hours/Week:4	
Core Course-6		Credits:3	
Course Code **20UMTC32**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: define sequence, series and its properties. [K1]

CO2: explain the basic concepts in sequences and series with examples. [K2]

CO3: apply the logical arguments for proving characterization, equivalence criterions in sequences and series. [K3]

CO4: analyze the behavior of sequences and series using various results and tests. [K4]

CO5: assess the convergence and divergence of sequences and series. [K5]

UNIT I

Sequences: Sequences – Bounded Sequences - Monotonic Sequences – Convergent Sequences - Divergent and Oscillating Sequences. (12 Hours)

UNIT II

Sequences Continued: The Algebra of Limits – Behaviour of Monotonic Sequences (12 Hours)

UNIT III

Sequences Continued: Some Theorems on Limits – Subsequences – Cauchy Sequences (12 Hours)

UNIT IV

Series of positive terms: Infinite Series- Comparison (12 Hours)

UNIT V

Series of positive terms Continued: Kummer's Test – D'Alembert's ratio Test – Raabe's Test – Gauss Test – Root Test and Condensation Test (12 Hours)

TEXTBOOK

Arumugam.S and Thangapandi Isaac.A. (2014). *Sequences and Series*, New Gamma Publishing House.

Unit	Chapter	Section
I	3	3.1-3.5
II	3	3.6, 3.7
III	3	3.8, 3.9, 3.11
IV	4	4.1, 4.2
V	4	4.3, 4.4

Course Code 20UMTC32	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	M	H	L	M	L	L	M	L	-	-
CO2	M	H	L	L	M	L	M	L	-	-
CO3	M	H	M	M	M	L	H	L	L	-
CO4	M	H	M	H	M	L	H	M	L	-
CO5	M	H	L	L	M	L	H	L	L	-

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B.Sc. MATHEMATICS
(2023-24onwards)

Semester III	**SEQUENCES AND SERIES**	Hours/Week:4	
Core Course-6		Credits:3	
Course Code **20UMTC32N**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: define sequence, series and its properties. [K1]

CO2: explain the basic concepts in sequences and series with examples. [K2]

CO3: apply the logical arguments for proving characterization, equivalence criterions in sequences and series. [K3]

CO4: analyze the behavior of sequences and series using various results and tests. [K4]

CO5: assess the convergence and divergence of sequences and series. [K5]

UNIT I Sequences

Preliminaries - Sequences – Bounded Sequences - Monotonic Sequences – Convergent Sequences - Divergent and Oscillating Sequences. (12 Hours)

UNIT II

Sequences Continued

The Algebra of Limits – Behaviour of Monotonic Sequences (12 Hours)

UNIT III

Sequences Continued

Some Theorems on Limits – Subsequences – Cauchy Sequences (12 Hours)

UNIT IV

Series of positive terms

Infinite Series- Comparison (12 Hours)

UNIT V

Series of positive terms Continued

Kummer's Test – D'Alembert's ratio Test – Raabe's Test – Gauss Test – Root Test and Condensation Test. (12 Hours)

TEXTBOOK

Arumugam.S and Thangapandi Isaac.A. (2014). *Sequences and Series*, New Gamma Publishing House.

Unit	Chapter	Section
I	3	3.1-3.5
II	3	3.6, 3.7
III	3	3.8, 3.9, 3.11
IV	4	4.1, 4.2
V	4	4.3, 4.4

REFERENCE BOOKS:

1. Richard R. Goldberg (1970), *Methods of Real Analysis*, Oxford & IBH Publishing Co.
2. Shanthi Narayanan and Raisinghania. M. D. (2007), *Elements of Real Analysis*, S. Chand and Company Ltd.,

Course Code 20UMTC32N	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	M	H	L	M	L	L	M	L	-	-
CO2	M	H	L	L	M	L	M	L	-	-
CO3	M	H	M	M	M	L	H	L	L	-
CO4	M	H	M	H	M	L	H	M	L	-
CO5	M	H	L	L	M	L	H	L	L	-

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B.Sc. MATHEMATICS
(2020-21onwards)

Semester III	**OPERATIONS RESEARCH**	Hours/Week:6	
Allied Course–II		Credits:4	
Course Code **20UAMA31**		Internal 25	External 75

COURSEOUTCOMES

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

CO1: explain LPP, its canonical form, standard forms and special classes. [K1]

CO2: express real life problems into mathematical models. [K2]

CO3: apply efficient computational techniques and algorithms that are needed to solve optimization problems. [K3]

CO4: analyze the real life situation and find solutions to the problems through O.R techniques. [K4]

CO5: predict the optimality in some real life situations. [K5]

UNIT I

Linear Programming Problem – Mathematical Formulation

Introduction – Mathematical Formulation of the Problem – Illustrations on Mathematical Formulation of LPP.

Linear Programming Problem – Graphical Solution and Extension

Introduction – Graphical Solution Method – Some Exceptional Cases. (18 Hours)

UNIT II

General Linear Programming Problem

Canonical and Standard forms of LPP.

Linear Programming Problem - Simplex Method

Introduction – The Computational Procedure - Use of Artificial Variables: Big – M Method (Method of Penalties) Degeneracy in Linear Programming (19 Hours)

UNIT III

Transportation Problem

Introduction –LP Formulation of The Transportation Problem - Existence of solution in TP – The Transportation Table – Loops in Transportation Tables – Solution of a Transportation Problem- Finding an Initial Basic Feasible Solution – Test for Optimality – Degeneracy in Transportation Problem–Transportation Algorithm. (17 Hours)

UNIT IV

Games and strategies

Introduction – Two – Person Zero – Sum Games – Some Basic Terms – The Maximin – Minimax Principle – Games Without Saddle Points – Mixed Strategies - Graphic solution of 2xn and mx2 Games – Dominance Property. (17 Hours)

UNIT V

Assignment Problem

Introduction-Mathematical Formulation of the Problem –Solution Methods of Assignment Problem: Hungarian Assignment Method – Special Cases in Assignment Problem.

Sequencing problem

Introduction – Problem of Sequencing- Basic Terms Used in Sequencing –Processing n Jobs Through TWO Machines – Processing n Jobs Through k Machines. (19 Hours)

TEXT BOOK

Kanti Swarup, Gupta P.K,Man mohan, (2013). *Operations Research*, Sultan Chand and sons.

Unit	Chapter	Section
I	2	2.1, 2.3, 2.4 (Problems from 201 to 210 only)
	3	3.1, 3.2, 3.3
II	3	3.4, 3.5(Results without proof)
	4	4.1, 4.3, 4.4,4.5
III	10	10.1, 10.2, 10.3, 10.5, 10.6, 10.8, 10.9,10.10, 10.12, 10.13
IV	17	17.1-17.7
V	11	11.1-11.4
	12	12.1-12.5

Course Code 20UAMA31	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	M	L	L	-	M	M	L	-	M	-
CO2	M	L	M	-	H	H	M	-	M	-
CO3	M	L	M	-	H	H	M	-	M	-
CO4	M	L	M	-	H	H	M	M	M	-
CO5	M	L	M	-	H	H	M	M	M	-

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B.Sc. MATHEMATICS
(2023-24onwards)

Semester III	**OPERATIONS RESEARCH WITH EXCEL SOLVER**	Hours/Week:6	
Allied Course–II		Credits:4	
Course Code **20UAMA31N**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: explain LPP, its canonical form, standard forms and special classes. [K1]

CO2: express real life problems into mathematical models. [K2]

CO3: apply efficient computational techniques and algorithms that are needed to solve optimization problems. [K3]

CO4: analyze the real life situation and find solutions to the problems through O.R techniques. [K4]

CO5: predict the optimality in some real life situations. [K5]

UNIT I

Linear Programming Problem – Mathematical Formulation

Introduction – Mathematical Formulation of the Problem – Illustrations on Mathematical Formulation of LPP.

Linear Programming Problem – Graphical Solution and Extension

Introduction – Graphical Solution Method – Some Exceptional Cases. (18 Hours)

UNIT II

General Linear Programming Problem

Canonical and Standard forms of LPP.

Linear Programming Problem - Simplex Method

Introduction – The Computational Procedure - Use of Artificial Variables: Big – M Method (Method of Penalties) Degeneracy in Linear Programming - Solving problems using Excel solver.

(19 Hours)

UNIT III

Transportation Problem

Introduction –LP Formulation of The Transportation Problem - Existence of solution in TP – The Transportation Table – Loops in Transportation Tables – Solution of a Transportation Problem- Finding an Initial Basic Feasible Solution – Test for Optimality – Degeneracy in Transportation Problem–Transportation Algorithm - Solving problems using Excel solver. (17 Hours)

UNIT IV

Games and strategies

Introduction – Two – Person Zero – Sum Games – Some Basic Terms – The Maximin – Minimax Principle – Games Without Saddle Points – Mixed Strategies - Graphic solution of 2xn and mx2 Games – Dominance Property. (17 Hours)

UNIT V

Assignment Problem

Introduction-Mathematical Formulation of the Problem –Solution Methods of Assignment Problem: Hungarian Assignment Method – Special Cases in Assignment Problem - Solving problems using Excel solver.

Sequencing problem

Introduction – Problem of Sequencing- Basic Terms Used in Sequencing –Processing n Jobs Through TWO Machines – Processing n Jobs Through k Machines. (19 Hours)

TEXT BOOK

Kanti Swarup, Gupta P.K,Man mohan, (2013). *Operations Research,* Sultan Chand and sons.

Unit	Chapter	Section
I	2	2.1, 2.3, 2.4 (Problems from 201 to 210 only)
	3	3.1, 3.2, 3.3
II	3	3.4, 3.5(Results without proof)
	4	4.1, 4.3, 4.4,4.5
III	10	10.1, 10.2, 10.3, 10.5, 10.6,10.8, 10.9,10.10, 10.12, 10.13
IV	17	17.1-17.7
V	11	11.1-11.4
	12	12.1-12.5

REFERENCE BOOKS

1. Arumugam, Issac (2015), *Topics in Operations Research – Linear Programming*, New Gamma Publishing House.

2. Sharma.S.D. (Reprint 2008), *Operations Research*, Kedar Nath Ram Nath, Meerut, Delhi.

Course Code 20UAMA31N	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	M	L	L	-	M	M	L	-	M	-
CO2	M	L	M	-	H	H	M	-	M	-
CO3	M	L	M	-	H	H	M	-	M	-
CO4	M	L	M	-	H	H	M	M	M	-
CO5	M	L	M	-	H	H	M	M	M	-

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B.Sc. MATHEMATICS
(2020-21onwards)

Semester III	**MATLAB -PRACTICAL**	Hours/Week:2	
SEC 2		Credits:2	
Course Code **20UMTS31P**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: execute the technical coding for efficient usage of MATLAB software. [K3]

CO2: interpret the usage of various syntax in MATLAB. [K3]

CO3: apply MATLAB for solving mathematical problems and for constructing bardiagram. [K3]

CO4: solve set of linear equations and perform operations on matrices. [K3]

CO5: determine the values of statistical constants, sum of the series, characteristic polynomial of a matrix, polynomial differentiation and polynomial integration. [K4]

List of Practical Programs in MATLAB:

1. Write a MATLAB program for evaluating the arithmetic operators addition, subtraction, multiplication, right division, left division, unaryminus, unaryplus and exponentiation.
2. Write a MATLAB statement to calculate the sum of the series.
3. Write a MATLAB program to use various arithmetic operations on matrices such as addition, subtraction, multiplication, right division, left division and exponentiation.
4. Write a MATLAB program for some commands related to matrix such as determinant, rank, Eigen vectors and orthogonal.
5. Write a MATLAB program to determine/ solve the characteristic polynomial of amatrix, polynomial differentiation and polynomial integration.
6. Write a MATLAB program for polynomial addition, subtraction, multiplication, division and root of a polynomial
7. Write a MATLAB program for solving a set of linear algebraic equations.

8. Write a MATLAB program to find the mean, median, standard deviation, cumulative sum and cumulative product of a given statistical data.
9. Write a MATLAB program to plot a bar graph and horizontal bar graph for a given data.
10. Write a MATLAB program to obtain the differentiation of a given expression and evaluating the definite integral.

TEXT BOOKS

1. Rajkumar Bansal, AshokKumar Goel and Manoj Kumar Sharma.(2009). *MATLAB and its Applications in Engineering*, Dorling Kindersley (India) Pvt.Ltd.
2. Rudra Pratap, (2010).*Getting started with MATLAB – A Quick Introduction for Scientists And Engineers*, Oxford University Press.

TEXTBOOK1	
Chapter	**Sections**
2	2.5.1, 2.9
3	3.9, 3.10.1
4	4.4, 4.5, 4.6, 4.7, 4.9, 4.10, 4.11
6	6.7.4, 6.7.5
9	9.3.2.1 &9.3.2.3
TEXTBOOK2	
5	5.1.1&5.3

Course Code 20UMTS31P	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	M	L	L	H	M	-	-	H	-	-
CO2	M	L	L	M	M	-	-	H	-	-
CO3	M	L	M	M	H	L	H	H	L	L
CO4	H	M	H	H	H	M	L	H	-	-
CO5	H	M	M	M	H	M	M	H	L	-

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B.Sc. MATHEMATICS
(2020-21onwards)

Semester IV	**DYNAMICS**	Hours/Week: 3	
CoreCourse-7		Credits:3	
Course Code **20UMTC41**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: define the basic concepts in the description of the motion of particles. [K1]

CO2: explain the characteristics of the motion of projectiles, simple harmonic motion, and motion under the action of central forces. [K2]

CO3: solve the problems in projectiles, simple harmonic and central orbital motions. [K3]

CO4: analyze the path of the projectile, its range, the motion of a particle executing simple harmonic motion, and motion in the plane under central forces. [K4]

CO5: evaluate the parameters in projectiles on an inclined plane, composition of two simple Harmonic motions, pedal equations of some well known curves. [K5]

UNIT I

Projectiles

Definitions –Two Fundamental Principles – To show that the path of a projectile is a parabola-Characteristics of the Motion of a Projectile – A particle is projected horizontally from a point at a certain height above the ground; to show that the path described by it is a Parabola-To determine when the horizontal range of a Projectile is maximum, given the magnitude of the velocity of projection - To show that, for a given initial velocity of projection there are, in general two possible directions of projections so as to obtain a given horizontal range. (9 Hours)

UNIT II

Projectiles Continued

To find the velocity of the projectile in magnitude and direction at the end of timet-To show that the velocity at any point P of a Projectile is equal in magnitude to the velocity acquired in falling freely from the directrix to the point – Given the magnitude of the velocity of projection, to show that there are two directions of projection for the particle so to reach a given point- Range

on an inclined plane - To find the greatest distance of the projectile from the inclined plane and show that is attained in half the total time off light – To determine when the range on the inclined plane is maximum, given the magnitude of the velocity of projection – To show that, for a given initial velocity of projection, there are, in general, two possible directions of projection so as to obtain a given range on an inclined plane-Motion on the surface of a smooth inclined plane.

(9 Hours)

UNIT III

Simple Harmonic Motion

Introduction – Simple Harmonic Motion in a straight line – General solution of S.H.M equation – Geometrical Representation of a Simple Harmonic Motion - Change of origin – Composition of two Simple Harmonic Motions of the same period and in the same straight line.

(9 Hours)

UNIT IV

Motion Under the Action of Central Forces

Introduction-Velocity and Acceleration in polar coordinates - Equations of motion in polar Coordinates - Note on the equiangular spiral – Motion under a central force –Differential equation of central orbits - Perpendicular from the pole on the tangent formulae in polar coordinates.

(9 Hours)

UNIT V

Motion Under the Action of Central Forces Continued

Pedal equation of the central orbit – Pedal equation of some of the well known curves – Velocities in a central orbit – Two fold problems in central orbits - Apses and apsidal distances- Given the law of force to the pole to find the orbit. (9 Hours)

TEXT BOOK

Venkataraman, M.K.,(July 2015,17thedition).*Dynamics*, Agasthiar Publications.

Unit	Chapter	Section
I	6	6.1-6.8
II	6	6.9-6.16
III	10	10.1-10.6
IV	11	11.1-11.7
V	11	11.8-11.13

Course Code 20UMTC41	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	H	H	H	H	H	M	H	M	H	-
CO2	H	H	H	H	H	M	H	M	H	-
CO3	H	H	H	H	H	M	H	M	H	-
CO4	H	H	H	H	H	M	H	M	H	-
CO5	H	H	H	H	H	M	H	M	H	-

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B.Sc. MATHEMATICS
(2020-21onwards)

Semester IV	**TRIGONOMETRY AND VECTOR CALCULUS**	Hours/Week:4	
Core Course-8		Credits:3	
Course Code **20UMTC42**		Internal 25	External 75

COURSEOUTCOMES

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

CO1: define various trigonometric functions, logarithms of a complex number and vector valued functions. [K1]

CO2: explain the concept of De Moivre's theorem, hyperbolic function, gradient, curl and surface integrals. [K2]

CO3: apply the knowledge gained in trigonometry and vector calculus to solve the real life problems. [K3]

CO4: Analyze the practical problems and enhance their knowledge for a successful career. [K4]

CO5: evaluate the trigonometric functions, vector valued functions in all domains. [K5]

UNIT I

Applications of De Moivre's Theorem

Expression for $\sin n\theta$,$\cos n\theta$,and $\tan n\theta$-Expression for $\sin^n \theta$and $\cos^n \theta$–Expansion of $\sin\theta$,$\cos\theta$, $\tan\theta$ in powers of θ. (12 Hours)

UNIT II

Hyperbolic Functions

Hyperbolic Functions – Inverse Hyperbolic Functions.

Logarithm of a Complex Number

Logarithm of a Complex Number. (12 Hours)

UNIT III

Vector Differentiation

Differentiation of Vectors–Gradient. (12 Hours)

UNIT IV

Vector Differentiation continued

Divergence and Curl.

Line and Surface Integrals

Line Integrals. (12 Hours)

UNIT V

Line and Surface Integrals Continued

SurfaceIntegrals.StatementsofGreen,GaussandStokestheorems.(Without Proof)-Problems only.

(12 Hours)

TEXTBOOKS

1. Arumugam &Isaac. (Nov 2012). *Trigonometry*, MKU & MSU (CBCS syllabus) New Gamma Publishing House.
2. Arumugam & Isaac. (Jan 2014). *Analytical Geometry 3D and Vector Calculus*, New Gamma Publishing House.

TEXTBOOK 1		
Unit	**Chapter**	**Section**
I	1	1.1, 1.2, 1.3
II	2	2.1, 2.2
	3	full
TEXTBOOK 2		
III	5	5.2, 5.3
IV	5	5.4
	7	7.1
V	7	7.2, 7.3

Course Code 20UMTC42	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	H	H	M	M	H	L	M	L	-	-
CO2	H	H	M	M	H	L	M	L	-	-
CO3	H	H	M	M	H	L	M	L	-	-
CO4	H	H	M	M	H	L	M	L	-	-
CO5	H	H	M	M	H	L	M	L	-	-

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B.Sc. MATHEMATICS
(2020-21onwards)

Semester IV	**PROGRAMMING IN C**	Hours/Week: 4	
Allied Course-II		Credits:4	
Course Code **20UAMA41**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: describe the fundamentals of C-programming language. [K1]

CO2: explain the concept of operators, decision making statements, arrays, functions, structures, unions and file management in C. [K2]

CO3: use appropriate syntax for operators, decision making statements, strings, structures and unions. [K3]

CO4: analyze the role of data types, decision making statements, user defined functions and file managements in C. [K4]

CO5: conclude the solution of many real life problems easily by using C programming language. [K5]

UNIT I

Constants, Variables and Data Types:

Introduction- Character set – C tokens - Keywords and Identifiers- Constants-Variables-Data types–Declaration of Variables, Storage Class – Assigning Values to Variables – Defining Symbolic Constants–Declaring a Variable as Constant, Volatile – Overflow and Underflow of data.

Operators and Expressions:

Introduction - Arithmetic, Relational, Logical, Assignment Operators – Increment and Decrement Operators– Conditional Operators, Bitwise Operators, Special Operators - Arithmetic Expression –Evaluation of Expressions – Precedence of Arithmetic Operators – Some Computational Problems–Type Conversions in Expressions – Operator Precedence and Associativity – Mathematical Functions. (12 Hours)

UNIT II

Managing Input and Output Operations:

Introduction – Reading and Writing a Character – Formatted Input, Output.

Decision Making and Branching:

Introduction – Decision Making with if Statement – Simple if Statement –the if……else Statement - nesting of if…else Statements – The else if Ladder – The Switch Statement - The? : Operator – The go to Statement. (12 Hours)

UNIT III

Decision Making and Looping:

Introduction - The while Statement – The do Statement – The for Statement – Jumps in Loops.

Arrays:

Introduction – One Dimensional Arrays – Declaration, Initialization of One-dimensional Arrays – Two dimensional Arrays – Initializing Two – dimensional Arrays-Multidimensional arrays - Dynamic arrays. (12 Hours)

UNIT IV

Character Arrays and Strings:

Introduction – Declaring and Initializing String Variables – Reading Strings from Terminal – Writing Strings to Screen – Arithmetic Operations on Characters – Putting Strings Together – Comparison of Two Strings – String – Handling Functions – Table of Strings – Other Features of Strings.

User Defined Functions:

Introduction – Need for User Defined Functions – A Multi Function Program – Elements of User Defined Functions – Definition of Functions – Return Values and Their Types – Function Calls-Function Declaration – Category of Functions – No Arguments and No Return Values – Arguments but No Return Values – Arguments with Return Values – No Arguments but Returns a value – Functions that Return Multiple Values – Nesting of Functions – Recursion – Passing Arrays to Functions – Passing Strings to Functions – The Scope, Visibility and Life time of Variables – Multifile Programs. (12 Hours)

UNIT V

Structures and Unions:

Introduction – Defining a Structure – Declaring Structure Variables – Accessing Structure Members –Structure Initialization – Copying and Comparing Structure Variables – Operations on

Individual Members –Arrays of Structures – Arrays with in Structures – Structures with in Structures – Structures and functions–Unions – Size of Structures – Bit Fields.

File Management in C:

Introduction – Defining and Opening a File – Closing a File - Input/ Output Operations on Files –Error Handling During I/O Operations – Random Access to Files – Command Line Arguments.

The Preprocessor:

Introduction – Macro Substitution – File Inclusion (12 Hours)

TEXTBOOK

Balagurusamy.E. (5th Reprint 2017). *Programming in ANSI C*, (7th Edition), Chennai: McGraw Hill Education (India) Private Limited.

Unit	Chapter	Section/Page Number
I	2	22–45
	3	51–73
II	4	81–102
	5	111–136
III	6	149–174
	7	189–215
IV	8	234–258
	9	267–311
V	10	320–343
	12	391–412
	14	447-452

Course Code 20UAMA41	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	M	M	-	M	M	L	L	H	L	-
CO2	M	M	-	M	M	L	L	H	L	-
CO3	M	M	-	M	M	L	L	H	L	-
CO4	M	M	-	M	M	L	L	H	L	-
CO5	M	M	-	M	M	L	L	H	L	-

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B.Sc. MATHEMATICS
(2020-21onwards)

Semester IV	**C- PRACTICAL**	Hours/Week:2	
Allied Course-II		Credits:2	
Course Code **20UAMA41P**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: interpret the basic principles of C Programming. [K3]

CO2: apply the concept of operators, decision making statements, functions and file management in Programming. [K3]

CO3: acquire programming skills. [K3]

CO4: develop programs using the basic elements like control statements, Arrays and Strings. [K3]

CO5: analyze the programming structure of C language. [K4]

List of Practical Programs in C:

1.(a) Program to calculate simple and compound interest for the given data

(b) Program to convert temperature in Fahrenheit to Celsius.

2.(a) Program to check whether the given number is odd or even

(b) Program to assign grade for student mark statement

3.(a) Program to evaluate sine series.

(b) Program to check whether the given number is a prime number.

4. Program to multiply the given two matrices

5. Program to solve quadratic equation using switch statement.

6. Program to check whether two strings are Anagrams.

7.(a) Program to generate the first n terms of the Fibonacci sequence using recursion

(b) Program to construct Pascal triangle for a given positive integer

8. Program to calculate mean and standard deviation of a given set of numbers using function.

9. Program to maintain employee details using structures.

10. Program to reverse a String.

11. Program for bank transaction.

12. Program to illustrate the macro definitions.

Course Code 20UAMA41P	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	M	M	M	M	M	L	L	H	L	-
CO2	M	M	L	M	M	L	L	H	L	-
CO3	M	M	M	M	M	L	L	H	L	-
CO4	M	M	L	M	M	L	L	H	L	-
CO5	M	M	M	M	M	L	L	H	L	-

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B.Sc. MATHEMATICS
(2020-21onwards)

Semester IV	**INTEGRAL TRANSFORMS**	Hours/Week:2	
SEC-3		Credits:2	
Course Code **20UMTS41**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: define Laplace transforms, Fourier transforms, Fourier sine and cosine transforms. [K1]

CO2: explain the concepts of Laplace transforms, Fourier transforms, Fourier sine and cosine transforms and their properties. [K2]

CO3: apply Laplace transforms, Inverse Laplace transforms, Fourier transforms, Fourier sine and cosine transforms and their properties to get the solution of problems in other disciplines. [K3]

CO4: solve the integral, differential equations using Laplace transforms, Fourier transforms. [K3]

CO5: determine the Laplace transforms, Inverse Laplace transforms, Fourier transforms, Fourier sine and cosine transforms, for the given functions. [K4]

UNIT I

Laplace Transforms:

Definition – piecewise continuity – sufficient conditions for the existence of Laplace Transforms – Laplace Transform of periodic function – some general theorems.

(6 Hours)

UNIT II

The Inverse Transforms:

Inverse Transform of a given function – Inverse Laplace Transform of certain functions by the method of Partial Fractions. (6 Hours)

UNIT III

Application of Laplace Transforms:

Solution of ordinary differential equations with constant coefficients – solution of system of differential equations. (6 Hours)

UNIT IV

Fourier Transforms:

Complex form of Fourier integral formula – Fourier Integral theorem – properties of Fourier Transform – Fourier cosine transform – Fourier sine transform. (6 Hours)

UNIT V

Properties of F_c&F_s ,Parseval's identity – convolution theorem. (6 Hours)

TEXT BOOK

1. Narayanan, Manicavachagom Pillay, T.K., (2011). *Calculus- Vol-III,* S.Viswanathan Printers and Publishers Pvt. Ltd.

REFERENCES

1. Narayanan, Manicavachagom Pillay, T.K., (2002). *Advanced Methods For Engineering Students - Vol-III,* S.Viswanathan Printers and Publishers Pvt. Ltd.
2. Narayanan, Manicavachagom Pillay, T.K., (2010). Differential equations and its Applications- S.Viswanathan Printers and Publishers Pvt. Ltd.

Unit	Chapter	Section
I	5	1, 1.1, 1.2, 2, 3, 4, 5
II	5	6, 7
III	5	8, 9
IV	6	9.1, 9.2, 10, 11.1, 11.2
V	6	12, 13, 14.1, 15

Course Code 20UMTS41	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	H	H	M	M	M	L	M	M	-	-
CO2	H	H	M	M	M	M	M	M	-	-
CO3	H	H	H	M	L	L	M	M	-	-
CO4	H	H	M	M	M	L	M	L	-	-
CO5	H	H	M	M	L	L	M	L	-	-

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Semester IV	**Internship / Field Project (2020 -21 onwards)**	Hours/Week:
PART IV		Credit: 1
Course Code **20UMTI41G**		Internal 100

COURSE OUTCOMES

On completion of the Internship/Field Project, students will be able to

CO1: relate their theoretical insights with hands-on experience. [K3]

CO2: develop technical skills to their respective field of study. [K3]

CO3: demonstrate the attributes such as observational skills, team spirit and inter personal skills built through site visits. [K3]

CO4: exhibit the written communication skills acquired through internship/field project. [K3]

CO5: analyze the observations and results and communicate their academic and technological knowledge appropriately oral means. [K4]

GENERAL INSTRUCTIONS:

- **Internship:** A designated activity that carries one credit involving not less than 15 days of working in an organization under the guidance of an identified mentor
- **Field Project:** Students comprising of maximum 5 members in a team need to undertake a project that involves conducting surveys inside/outside the college premises and collection of data from designated communities or natural places.
- Internal Assessment only.

Course Code 20UMTI41G	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	H	M	M	M	M	H	-
CO2	H	M	M	M	M	H	
CO3	H	M	-	-	-	H	
CO4	H	H	M	M	-	M	H
CO5	H	M	H	H	M	-	

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B.Sc. MATHEMATICS
(2020-21onwards)

Semester V	**MODERN ALGEBRA**	Hours/Week: 5	
Core Course-9		Credits: 4	
Course Code **20UMTC51**		Internal **25**	External **75**

COURSE OUTCOMES

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

CO1: define the basic concepts in theory of Groups and Rings. [K1]

CO2: explain the fundamental concepts in permutation groups, cyclic groups, normal groups, isomorphism of groups, integral domains and characteristics of a ring. [K2]

CO3: apply the properties and results of groups and rings to solve problems. [K3]

CO4: analyze the equivalence criterions and characteristics of groups and rings of various types. [K4]

CO5: justify the statements in algebraic structure with illustrations. [K5]

UNIT I

Relations and Mappings

Relations – Equivalence Relations- Partial order-Functions – Binary Operations.

Groups

Permutation Groups - Subgroups. (15 Hours)

UNIT II

Groups

Cyclic Groups – Order of an Element- Cosets and Lagrange's Theorem- Euler's Theorem – Fermat's Theorem- Solved Problems. (15 Hours)

UNIT III

Groups

Normal Subgroups-Examples- Solved Problems - Quotient Groups – Examples-Isomorphism-Automorphism-Inner automorphism - Solved Problems. (15 Hours)

UNIT IV

Groups

Homomorphisms - Examples-Kernel of a homomorphism-Fundamental theorem of homomorphism- Solved Problems

Rings

Definitions and examples – Elementary Properties of rings- Isomorphism.

(15 Hours)

UNIT V

Rings

Types of Rings – Ring with identity - skew field – Field –Zero divisor- Integral domain- Solved Problems-Characteristic of a Ring. (15 Hours)

TEXT BOOK:

Arumugam. S and Thangapandi Isaac.A(2017), *Modern Algebra*, SciTech Publications (India) Pvt., Lt

Unit	Chapter	Section
I	2	2.1-2.5
	3	3.4 and 3.5
II	3	3.6 -3.8
III	3	3.9 and 3.10
IV	3	3.11
	4	4.1- 4.3
V	4	4.4,4.5

REFERENCE BOOKS:

1. Vijay K. Khanna, Bhambri. S. K. (2016), *A Course in Abstract Algebra,* Fifth Edition, Vikas Publishing House, Pvt. Ltd.,
2. Joseph A. Gallian (2021), *Contemporary Abstract Algebra*, Ninth Edition, Cengage Publications.

Course Code 20UMTC51	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	H	H	H	L	M	L	L	H	L	L
CO2	H	H	H	L	M	L	L	H	L	L
CO3	H	H	H	L	M	L	L	H	L	L
CO4	H	H	H	L	M	L	L	H	L	L
CO5	H	H	H	M	M	M	M	H	M	M

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B.Sc. MATHEMATICS
(2020-21onwards)

Semester V	**REAL ANALYSIS**	Hours/Week: 5	
Core Course-10		Credits: 4	
Course Code		Internal	External
20UMTC52		**25**	**75**

COURSE OUTCOMES

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

CO1: define the basic concepts in Real Analysis. [K1]

CO2: explain the properties of metric spaces, sequences, continuity, uniform continuity, connectedness and compactness. [K2]

CO3: solve the problems in Real Analysis. [K3]

CO4: analyse the proofs of various theorems in Real Analysis. [K4]

CO5: assess the concepts in various theorems and corollaries. [K5]

UNIT I

Preliminaries:

Countable sets – Uncountable sets – Inequalities of Holder and Minkowski

Metric Spaces:

Definitions and examples – Bounded sets in a metric space – Open ball in a metric space – Open sets – Subspaces – Interior of a set. (15 Hours)

UNIT II

Metric Spaces:

Closed sets – Closure – Limit point – Dense sets.

Complete Metric Space:

Completeness – Baire's Category theorem. (15 Hours)

UNIT III

Continuity :

Continuity - Homomorphism - Uniform continuity (15 Hours)

UNIT IV

Connectedness

Definition and examples - Connected subsets of R -Connectedness and continuity.

(15 Hours)

UNIT V

Compactness:

Compact space – Compact subsets of R – Compactness and continuity. (15 Hours)

TEXT BOOK:

Dr. Arumugam.S, Mr.Thangapandi Isaac.A, (2015), *Modern Analysis*, New Gamma Publishing House

Unit	Chapter	Section
I	1	1.2 – 1.4
	2	2.1 – 2.6
II	2	2.7 – 2.10
	3	3.1, 3.2
III	4	4.1 - 4.3
IV	5	5.1 – 5.3
V	6	6.1, 6.2 and 6.4

REFERENCE BOOKS:

1. Copson (1989), *Metric Spaces*, Universal Bookstall, New Delhi.

2. Richard & Goldberg (1970), *Methods of Real analysis*, Oxford and IBH Publishing Co.Pvt.Ltd, New Delhi

Course Code 20UMTC52	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	H	H	H	H	H	M	M	L	-	-
CO2	H	H	H	H	H	L	M	L	-	-
CO3	H	H	M	M	M	L	H	L	L	-
CO4	H	H	M	M	M	M	M	L	L	-
CO5	H	H	M	M	M	L	H	L	L	-

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B.Sc. MATHEMATICS
(2020-21onwards)

Semester V	**NUMERICAL METHODS**	Hours/Week: 5	
Core Course-11		Credits: 4	
Course Code		Internal	External
20UMTC53		**25**	**75**

COURSE OUTCOMES

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

CO1: identify the location of the roots of the equations, types of operators, finite differences and the suitable formula for solving numerical problems. [K1]

CO2: explain the various numerical methods in finding the solution of numerical problems. [K2]

CO3: solve the numerical problems in finding the approximate roots of the equations, interpolation, finite differences and numerical differentiation and integration. [K3]

CO4: analyze the given data and the solution of numerical problems. [K4]

CO5: assess the numerical problems with suitable techniques. [K5]

UNIT I

The Solution of Numerical Algebraic and Transcendental Equations

Introduction-The Bisection Method – Method of Succesive Approximations or the Iteration Method – The Method of False Position(Regula Falsi Method) – Newton's Iteration method or Newton– Raphson method.

Simultaneous Linear Algebraic Equations

Introduction-Gauss Elimination Method – Gauss Jordan Method –Computation of the Inverse of a matrix using Gauss's elimination method – Iterative Methods. (15 Hours)

UNIT II

Finite Differences

Introduction-First Differences – Higher differences – Difference Tables –To express any value of y in terms of initial value y_0 and the differences - Backward differences- To express any value of y in terms of y_n and the backward differences- Central difference Notation – Properties of the operator Δ – Differences of a polynomial – Factorial Polynomials – The Operator E - Relation between the operators E and Δ – Relation between the operators D and Δ - Other Difference Operators - Relation between the operators. (15 Hours)

UNIT III

Interpolation

Introduction- Linear interpolation – Gregory-Newton Forward Interpolation Formula – Gregory-Newton Backward Interpolation Formula – Equidistant terms with one or more missing values.

Central Difference Interpolation Formulae

Central Difference Tables-Central Difference Interpolation Formulae – Gauss's forward interpolation formula – Gauss's Backward Interpolation Formula – Stirling's Formula.

Interpolation with unequal intervals

Divided Differences- Properties of Divided Differences-Newton's interpolation formula for unequal intervals-Lagrange's Interpolation formula. (15 Hours)

UNIT IV

Numerical Differentiation and Integration

Introduction- Newton's forward difference formula to compute the derivatives - Newton's backward difference formula to compute the Derivatives - Derivatives using Stirling's formula – Maxima and Minima of a tabulated function. (15 Hours)

UNIT V

Numerical Differentiation and Integration

Numerical Integration - The Trapezoidal Rule - Truncation error in the Trapezoidal formula - Romberg's method - Simpson's Rule - Truncation error in Simpson's formula – Practical Applications of Simpson's rule. (15 Hours)

TEXT BOOK:

Venkataraman. M.K. (2013), *Numerical Methods in Science and Engineering*, The National Publishing Co., 5th Edition.

Unit	Chapter	Section
I	3	1- 5
	4	1 – 3 and 6
II	5	1 – 8, 10 – 12 and 14 - 18
III	6	1-5
	7	1-5
	8	1-4
IV	9	1-4 and 6
V	9	7 – 12

REFERENCE BOOKS:

1.Kandasamy P, Thilagavathi K, Gunavathy K (2013), *Numerical Methods* Third Edition, S.Chand & Company Pvt. Ltd. ,New Delhi.

2. Singaravelu A , (2004) , *Numerical Methods* First Edition ,Meenakshi Agency , Chennai.

Course Code 20UMTC53	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	H	H	M	M	M	M	M	L	L	-
CO2	H	H	M	M	M	M	M	L	L	-
CO3	H	H	M	M	M	M	M	L	L	-
CO4	H	H	M	M	M	M	M	L	L	-
CO5	H	H	M	M	M	M	M	L	L	-

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B.Sc. MATHEMATICS

(2020-21onwards)

Semester V	**STATISTICS - I**	Hours/Week: 4	
Core Course-12		Credits: 4	
Course Code **20UMTC54**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: define the basic concepts in statistics. [K1]

CO2: explain various statistical methods and techniques in solving problems. [K2]

CO3: apply statistical methods to solve the real life problems. [K3]

CO4: analyze the given data and interpret the results. [K4]

CO5: examine the data and draw conclusions. [K5]

Unit I

Moments, Skewness and Kurtosis

Moments – Moment about any point – Central Moment – Karl Pearson coefficient of skewness – Bowley's coefficient of skewness – Kurtosis and its types.

Curve Fitting

Principle of least squares – Fitting a Straight Line – Fitting a Second Degree Parabola.

(13 Hours)

Unit II

Correlation and Regression

Correlation – Rank Correlation –Regression – Correlation coefficient for a bivariate frequency distribution. (12 Hours)

Unit III

Theory of Attributes

Attributes – Consistency of Data – Independence and Association of Data.(11 Hours)

Unit IV

Index Numbers

Index Numbers – Consumer Price Index Numbers(Cost of living index numbers) – Conversion of Chain Base Index Number into Fixed Base Index Number and conversely.

Analysis of Time Series

Time Series – Components of a Time Series – Measurement of Trends. (13 Hours)

Unit V

Probability

Probability – Conditional Probability – Properties of Independent Events – Baye's Theorem – Boole's inequality – Theorems and Problems (11 Hours)

Text Book

Dr. Arumugam.S, Mr.Thangapandi Isaac.A, (2016), *Statistics*, New Gamma Publishing House

Unit	Chapter	Section
I	4	4.1, 4.2
	5	5.1
II	6	6.1, 6.2, 6.3, 6.4
III	8	8.1, 8.2
IV	9	9.1, 9.2, 9.3
	10	10.1, 10.2, 10.3
V	11	11.1, 11.2

REFERENCE BOOKS:

1. Dr. S.P.Gupta, (1969), *Statistical Methods*, Sultan Chand & Sons.
2. S.C.Gupta, V.K.Kapoor, (2001), *Elements of Mathematical Statistics*, Sultan Chand & Sons.

Course Code 20UMTC54	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	H	H	H	H	H	M	M	M	H	M
CO2	H	H	H	H	H	M	H	M	H	M
CO3	H	H	H	H	H	H	H	M	H	M
CO4	H	H	M	H	H	M	H	M	H	L
CO5	H	H	M	H	H	M	H	M	H	L

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B.Sc. MATHEMATICS

(2020-21onwards)

Semester V	**GRAPH THEORY WITH GRIN**	Hours/Week: 5	
DSEC -1		Credits: 4	
Course Code **20UMTE51**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: define the basic concepts in graph theory. [K1]

CO2: explain the concept of connectedness, Eulerian & Hamiltonian, Trees, Matchings, Planarity and Colouring in graphs. [K2]

CO3: apply the graph theoretical knowledge in real life problems. [K3]

CO4: analyze the various parameters in graph theory. [K4]

CO5: assess the results in Graph Theory. [K5]

UNIT I

Graphs and Subgraphs

Definition and examples - Degrees - Sub Graphs – Isomorphism - Ramsey Numbers - Independent Sets and Coverings – Matrices – Operations on Graphs. Plotting graph for a given set of vertices and edges using (15 Hours)

UNIT II

Connectedness:

Walks, Trails and Paths - Connectedness and Components – Connectivity. Finding Bridges, Cut vertex using GRIN. (15 Hours)

UNIT III

Eulerian and Hamiltonian Graphs

Eulerian Graphs - Hamiltonian Graphs. Finding Eulerian Path, Eulerian Cycle, Hamiltonian Path, Hamiltonian Cycle using GRIN.

Trees

Characterization of Trees – Center of a Tree. (15 Hours)

UNIT IV

Matchings and Planarity

Matchings - Matchings in Bipartite Graphs -Definition and Properties. (15 Hours)

UNIT V

Colourability

Chromatic Number and Chromatic Index - The Five Colour Theorem - Chromatic Polynomials. (15 Hours)

TEXT BOOK:

Dr. Arumugam. S and Ramachandran. S (May 2017), Invitation *to Graph Theory*, India: SCITECH Publications.

Unit	Chapter	Section
I	2	2.0 – 2.6 and 2.8, 2.9
II	4	4.0 - 4.2 and 4.4
III	5	5.0 - 5.2
	6	6.0 - 6.2
IV	7	7.0 - 7.2
	8	8.0 and 8.1
V	9	9.0 – 9.2 and 9.4

REFERENCE BOOKS :

1. Choudum S. A. (Reprinted 1999) , *A First Course in Graph Theory*, Macmillan India Limited, New Delhi.
2. Murugan M,(June 2005) , *Introduction to Graph Theory* , Muthali Publishing House, Chennai.
3. Wilson Robin J(1985), Introduction *to Graph Theory* , Third Edition, Longman Scientific & Technical, New York.

Course Code 20UMTE51	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	H	H	H	M	M	M	M	M	M	L
CO2	H	H	H	M	M	M	M	M	M	L
CO3	H	H	H	H	H	H	H	M	M	M
CO4	H	H	H	H	H	H	H	M	M	M
CO5	H	H	H	H	H	H	H	M	M	M

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B.Sc. MATHEMATICS
(2020-21onwards)

Semester V	**AUTOMATA THEORY**	Hours/Week: 5	
DSEC-2		Credits: 4	
Course Code **20UMTE52**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: define various automata such as deterministic and non – deterministic finite state machines, turing machines. [K1]

CO2: explain programming skills and software development. [K2]

CO3: apply standard algorithms to transform automata and languages in various ways. [K3]

CO4: analyze formal languages of different kinds such as regular and context free languages. [K4]

CO5: justify connections between theoretical results and regular –expression libraries. [K5]

UNIT I

Why study automata theory? - Introduction to formal proof - Additional forms of Proof- Inductive proofs - The central concepts of Automata theory. (15 Hours)

UNIT II

An informal picture of finite automata- Deterministic finite automata-Non-deterministic finite automata- An application: Text search-Finite automata with epsilon transitions.

(15 Hours)

UNIT III

Regular expressions- Finite automata and regular expressions- Applications of regular expressions-Algebraic laws of regular expressions. . (15 Hours)

UNIT IV

Proving languages are not regular- Closure properties of regular languages- Decision properties of regular languages- Equivalence and Minimization of automata. (15 Hours)

UNIT V

Context-free grammars- parse trees- Applications of context-free grammar - Ambiguity in grammars and languages- Definition of Push Down Automata- Languages of PDA- Equivalence of PDA's and CFG's Deterministic PDA. (15 Hours)

TEXT BOOK:

Hopcroft J.E, Motwani.R, and Ullman J.D (2001), *Introduction to Automata., Languages and Computation*, Pearson Education, Second Edition.

Unit	Chapter	Section
I	1	1.1 – 1.5
II	2	2.1 – 2.5
III	3	3.1 – 3.4
IV	4	4.1 – 4.4
V	5	5.1 – 5.4
	6	6.1 – 6.4

REFERENCE BOOKS:

1. Puntambekar Anuradha A (2018), *Automata and Computability*, Technical Publications, Second Revised Edition.
2. Dexter C.Kozen, (19 July 2007), *Automata and Computability (Undergraduate Texts in Computer Science)*, Springer Publications.

Course Code 20UMTE52	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	H	H	H	H	H	M	M	M	H	M
CO2	H	H	H	H	H	M	H	M	H	M
CO3	H	H	H	H	H	H	H	M	H	M
CO4	H	H	M	H	H	M	H	M	H	L
CO5	H	H	M	H	H	M	H	M	H	L

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B.Sc. MATHEMATICS
(2020-21onwards)

Semester V	**MATHEMATICAL MODELLING**	Hours/Week: 5	
DSEC- 3		Credits: 4	
Course Code **20UMTE53**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: define the procedure for solving problems through mathematical modelling. [K1]

CO2: explain the fundamental concept of mathematical modelling through different branches of mathematics [K2]

CO3: apply analytical techniques to solve mathematical problems in mathematical models. [K3]

CO4: analyze mathematical modelling problems in inter disciplinary level. [K4]

CO5: assess different types of mathematical models in real life situation. [K5]

Unit I

Mathematical Modelling: Need, Techniques, Classifications and simple illustrations

Simple situations requiring mathematical modeling- The Technique of mathematical modelling- Classification of mathematical models- Some characteristics of mathematical models- Mathematical modeling through Geometry- Mathematical modeling through Algebra (15 Hours)

Unit II

Mathematical Modelling: Need, Techniques, Classifications and simple illustrations

Mathematical modeling through Trigonometry- Mathematical modeling through Calculus- Limitations of Mathematical modeling

Mathematical Modelling through Ordinary differential equations of first order

Mathematical modeling through differential equations-Linear growth and decay models- Non – Linear growth and decay models (15 Hours)

Unit III

Mathematical Modelling through Ordinary differential equations of first order

Compartment Models- Mathematical Modelling in Dynamics through ordinary differential equations of first order- Mathematical Modelling of Geometrical problems through ordinary differential equations of first order. (15 Hours)

Unit IV

Mathematical Modelling through systems of Ordinary differential equations of first order

Mathematical Modelling in Population Dynamics - Mathematical Modelling of epidemics through systems of ordinary differential equations of first order. (15 Hours)

Unit V

Mathematical Modelling Through Graphs

Situations that can be modeled through graphs-Mathematical models in terms of directed graphs-Mathematical models in terms of signed graphs - Mathematical Modelling in terms of weighted digraphs- Mathematical Modelling in terms of unoriented graphs.

(15 Hours)

Text Book:

Kapur, J. N. (Second edition 2015), *Mathematical Modelling*, New Age International (P) LTD Publishers.

Units	Chapters	Sections
I	I	1.1 to 1.6
II	I	1.7 to 1.9
	II	2.1 to2. 3
III	II	2.4 to2. 6
IV	III	3.1 to 3.2
V	VII	7.1 to 7.5

REFERENCE BOOKS :

1. Hiordano.,M.D.Weir. and Fox W.P.(2003), A First Course in Mathematical Modelling, Third Edition,Vikas Publishing House,Pvt. Ltd.,
2. Clive L. Dym., (2006), Principles of Mathematical Modelling, Second Edition, Academic Press,Burlington.

Course Code 20UMTE53	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	H	M	H	H	H	M	M	M	H	H
CO2	H	H	H	H	H	H	M	H	H	H
CO3	H	M	H	H	H	M	M	M	H	H
CO4	H	M	H	H	H	M	H	H	H	H
CO5	H	H	H	H	H	H	H	H	H	H

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Dr.S. Kohila — Course Designer

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VIRUDHUNAGAR - 626 001

B.Sc. MATHEMATICS
(2020-21onwards)

Semester V	**PROJECT**	Hours/Week: 0	
Core Course-13		Credits: 1	
Course Code **20UMTC5PR**		Internal 60	External 40

COURSE OUTCOMES

On completion of the practical, the students will be able to

CO1: apply the learned concepts to select projects in Mathematics and related fields. [K3]

CO2: apply the theoretical knowledge to model the real life problem to calculate the required parameters. [K3]

CO3: execute the technical skills in finding the solutions to the problems and exihibit written communication skills acquired in related project. [K3]

CO4: analyze the accuracy of the results obtained and communicate academic knowledge orally. [K4]

CO5: assess the project through viva-voce to meet the challenges at higher education level/society level. [K5]

Students are expected to select a project in the field of Mathematics and related interdisciplinary fields. Two students can do one project. Minimum pages for project report should be 20 pages. Two typed copies of the report on the completed project will be submitted to the Controller of Examination through the Head of the department in the month of November during V semester. Evaluation will be done internally.

Project work & Report - 60 marks

Presentation & Viva-voce - 40 marks

Course Code 20UMTC5PR	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	H	H	H	H	H	H	H	M	M	L
CO2	H	H	H	H	H	M	H	M	M	L
CO3	H	H	H	H	H	M	H	M	M	L
CO4	H	H	H	H	H	M	H	M	M	L
CO5	H	H	H	H	H	M	H	M	M	L

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B.Sc. MATHEMATICS
(2020-21onwards)

Semester V	**SUMMATION OF SERIES**	Hours/Week: 2	
SEC-4		Credits: 2	
Course Code **20UMTS51**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: define the basic concepts in binomial expansion, exponential and logarithmic series. [K1]

CO2: explain the binomial theorem for rational index, results in exponential series, logarithmic series and some special cases. [K2]

CO3: apply the results in binomial expansion, exponential & logarithmic series, to find sum of the series, some constants and limits. [K3]

CO4: find a general term and expand the given expression, logarithm of a number using logarithmic series.[K3]

CO5: analyze the results in binomial expansion, exponential and logarithmic series. [K4]

Unit I

Binomial Theorem

Binomial theorem for a rational index (Statement only) – Some important particular cases of the binomial expansion – sign of terms in the Binomial expansion – Numerically greatest term –The method of splitting functions into partial fractions (6 Hours)

Unit II

Binomial Theorem

Application of the Binomial theorem to the summation of series – Sum of coefficients –Expansion of some function of x as a power series in two different ways– Approximate values (6 Hours)

Unit III

Exponential and Logarithmic series

The Exponential theorem (statement only) – Summation-Getting some identities (6 Hours)

Unit IV

Exponential and Logarithmic series

The Logarithmic series (statement only) – Modification of the logarithmic series- sums of the certain series using Logarithmic series- Euler's constant (6 Hours)

Unit V

Exponential and Logarithmic series

Series which can be summed up by the logarithmic series- Calculation of logarithms by means of the logarithmic series- The application of the exponential and logarithmic series to limits and approximations (6 Hours)

Text Book:

Manicavachagom pillay.T.K, Natarajan.T, GanapathyK.S(2017), *Algebra Volume I*, Divya Subramanian for Ananda Book Depot.

Units	Chapters	Sections
I	III	5 to 9
II	III	10 to 12, 14
III	IV	2, 3, 3.1, 4
IV	IV	5 to 8
V	IV	9 to 11

REFERENCE BOOKS:

1.Dr. Arumugam.S, Mr.Thangapandi Isaac.A(June 2001), *Summation of Series and Trigonometry*, New Gamma Publishing House.

2. Sudhir K Pundirsingh(2003), *Algebra & Trigonometry*, Meerat Pragathi Prakashan

Course Code 20UMTS51	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	H	H	M	H	H	M	M	L	-	-
CO2	H	H	M	H	H	L	M	L	-	-
CO3	H	H	H	H	H	L	M	L	L	-
CO4	H	H	M	M	M	M	M	L	L	-
CO5	H	H	M	M	M	L	M	L	L	-

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B.Sc. MATHEMATICS
(2020-21onwards)

Semester V	**NUMERICAL METHODS USING C**	Hours/Week: 2	
SEC-5		Credits: 2	
Course Code		Internal	External
20UMTS52P		40	60

COURSE OUTCOMES

On completion of the course, students will be able to

CO1: demonstrate C – Program to solve the algebraic & transcendental equations, simultaneous linear equations, interpolations, numerical differentiation and numerical integration. [K3]

CO2: use decision making, looping statements & functions to solve numerical problems using C. [K3]

CO3: discuss user defined functions to solve the algebraic & transcendental equations, simultaneous linear equations, interpolations, numerical differentiation and numerical integration using C. [K3]

CO4: construct C programs to solve the problems in numerical methods. [K3**]**

CO5: explore C Programming to solve numerical problems. [K4]

List of Practical Programs in Numerical Methods using C:

1. Program to find a root of the given equation using bisection method.
2. Program to find a root of the given equation using Regula-Falsi method.
3. Program to find a root of a given equation using Newton Raphson method
4. Program to solve the given system of linear equations by Gauss elimination method.
5. Program to find f(x) at a given point using Newton's interpolation formula.
6. Program to find f(x) at a given point using Lagrange's interpolation formula.
7. Program to evaluate dy/dx at a given point using Newton's differentiation formula.
8. Program to evaluate ∫ f(x) dx using Trapezoidal rule.
9. Program to evaluate ∫ f(x) dx using Romberg's method.
10. Program to evaluate ∫ f(x) dx using Simpson's 1/3 rule.

Course Code 20UMTS52P	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	H	H	M	M	M	L	L	H	M	-
CO2	H	H	M	M	M	L	L	H	M	-
CO3	H	H	M	M	M	L	L	H	M	-
CO4	H	H	M	M	M	L	L	H	M	-
CO5	H	H	M	M	M	L	L	H	M	-

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B.Sc. MATHEMATICS
(2020-21onwards)

Semester V	**ARITHMETIC ABILITY**	Hours: 0	
Extra credit course		Credits: 2	
Course Code **20UMTO51**		Internal 100	External ----

COURSE OUTCOMES

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

CO1: understand the basic principles of mathematics. [K1]

CO2: enhance their analytical ability and computational skills. [K2]

CO3: use appropriate arithmetical methods. [K3]

CO4: appear for competitive examinations with more confidence. [K4]

CO5: solve mathematical problems within a limited timeframe. [K5]

UNIT I

Problems on Ages

UNIT II

Ratio, Proportion and Partnership

UNIT III

Time and Work

UNIT IV

Time and Distance

UNIT V

Permutation and Combinations

TEXT BOOK

Ashish Aggarwal (7th Revised Edition 2014), *Quick Arithmetic*, S.Chand Publications, New Delhi.

Unit	Chapter
I	13
II	12
III	24
IV	25
V	34

Course Code 20UMTO51	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	H	H	M	H	M	M	H	H	L	L
CO2	H	H	M	H	M	M	H	H	L	L
CO3	H	H	M	H	M	M	H	H	L	L
CO4	H	H	M	H	M	M	H	H	L	L
CO5	H	H	M	H	M	M	H	H	L	L

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B.Sc. MATHEMATICS
(2020-21onwards)

Semester VI	**LINEAR ALGEBRA WITH SCILAB**	Hours/Week: 6	
Core Course-14		Credits: 4	
Course Code		Internal	External
20UMTC61		**25**	**75**

COURSE OUTCOMES

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

CO1: define the concepts in vector spaces, inner product spaces and theory of matrices. [K1]

CO2: explain the fundamental concepts of Linear Algebra. [K2]

CO3: make use of properties of vector spaces, linear transformations, inner product spaces and matrices to solve variety of problems. [K3]

CO4: analyze the characteristics and equivalence criterions of various concepts in Linear Algebra. [K4]

CO5: compute dimension, rank, nullity, matrices from a linear transformation, inner product of a vector space. [K5]

UNIT I

Vector Spaces

Definition and Examples – Subspaces – Linear Transformation. (18 Hours)

UNIT II

Vector Spaces

Span of a set – Linear independence – Basis and Dimension – Rank and Nullity - Matrix of a Linear Transformation.

(18 Hours)

UNIT III

Inner Product spaces

Definition and Examples – Orthogonality – Orthogonal Complement. Solving problems in Orthogonality using SCILAB. (18 Hours)

UNIT IV

Eigen values and Eigen vectors

Characteristic Equation and Cayley Hamilton Theorem -

Eigen values and Eigen vectors – Bilinear forms – Quadratic forms. Finding Eigen values, Eigen vectors of matrices, Quadratic forms using SCILAB. (18 Hours)

UNIT V

Similarity of Matrices

Similarity of Matrices – Diagonalizable Matrix – Diagonalization Theorem – Computation of Power of a Similar Matrix. Diagonalization of matrices using SCILAB.

(18 Hours)

TEXT BOOK:

1. Arumugam.S, Thangapandi Isaac.A, (2016), *Modern Algebra*, Scitech Publications Pvt., Ltd.
2. Vinit K.Sinha (2015), *Introduction to Matrix Theory*, Narosa Publishing House.

Text Book 1		
Unit	**Chapter**	**Section**
I	5	5.1 – 5.3
II	5	5.4 – 5.8
III	6	6.1 – 6.3
IV	7	7.7,7.8
	8	8.1,8.2
Text Book 2		
V	7	Pages 7.1-7.36

REFERENCE BOOKS:

1. Kenneth Hoffman and Ray Kunze (1971), *Linear Algebra*, Prentice Hall of India Private Limited.
2. Gupta, S. C. (2004), *An introduction to Matrices*, Sultan Chand & Sons.

Course Code 20UMTC61	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	H	H	H	L	M	L	L	H	L	L
CO2	H	H	H	L	M	L	L	H	L	L
CO3	H	H	H	L	M	L	L	H	L	L
CO4	H	H	H	L	M	L	L	H	L	L
CO5	H	H	H	M	M	M	M	H	M	M

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B.Sc. MATHEMATICS
(2020-21onwards)

Semester VI	**COMPLEX ANALYSIS**	Hours/Week: 6	
Core Course-15		Credits: 4	
Course Code		Internal	External
20UMTC62		**25**	**75**

COURSE OUTCOMES

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

CO1: define the basic concepts of analytic functions, conformal mapping, definite integrals, power series, residues and poles. [K1]

CO2: explain the basic notions in continuity, bilinear transformations, complex integration, convergence of series, contour integration. [K2]

CO3: apply the results and theorems in complex analysis to other disciplines. [K3]

CO4: analyze the convergence of power series, analyticity of functions and its singularities to determine value of the given integral. [K4]

CO5: assess the region of integration, poles and residues in solving problems. [K5]

UNIT I

Limits , Continuity and Analytic Functions

Limits – Continuity –Derivatives – Differentiation formula – Analytic functions – C-R equations – Harmonic Function. (18 Hours)

UNIT II

Conformal mapping and Transformations

Conformal mapping – Critical point – Transformations- Bilinear transformations – Elementary transformations – Cross ratio (Special Bilinear Transformations is not included). (18 Hours)

UNIT III

Definite Integrals

Properties of Definite integrals – Contour- Line integrals – Cauchy's integral theorem- Cauchy Goursat theorem (Without proof) – Cauchy's integral formula-

Derivatives of analytic functions- Morera's theorem – Cauchy's inequality- Lioville's theorem – Fundamental theorem of Algebra – Maximum modulus theorem. (18 Hours)

UNIT IV

Power Series

Abel's Theorem- Cauchy's general principle of convergence for a series – Elementary functions- Taylor's series – Laurent's series – Zeros of an analytic function –Singularities – Riemann's theorem- Weierstrass theorem. (18 Hours)

UNIT V

Residues and Poles

Residues – Calculation of Residues –Cauchy's Residue theorem- Contour integration.

(18 Hours)

Text Book

Manicavachagom Pillay T.K., Dr. Rajagopalan S.P. and Dr. Sattanathan R., (Revised Edition 2007), *Complex Analysis*, S.Viswanathan (Printers and Publishers) Pvt., Ltd.

Unit	Chapter	Pages
I	2	21-56
II	3	57-84 and 88-94
III	4	95-138 (Excluding proof of Cauchy Goursat theorem)
IV	5	139-172
V	6	173-240

REFERENCE BOOKS:

1. P.Duraipandian, Laxmi Duraipandian, D.Muhila,(1984), *Complex Analysis*, Emerald Publishers.
2. S.G.Venkatachalapathy (2006), *Complex Analysis*, Margham Publications.

Course Code 20UMTC62	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	H	H	H	H	H	M	M	L	L	-
CO2	H	H	M	H	H	L	M	L	L	-
CO3	H	H	H	H	M	L	M	L	L	-
CO4	H	H	M	M	M	M	H	L	L	-
CO5	H	H	M	M	M	L	M	L	L	-

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B.Sc. MATHEMATICS
(2020-21onwards)

Semester VI	**DIFFERENTIAL EQUATIONS AND ITS APPLICATIONS USING MATLAB**	Hours/Week: 6	
Core Course-16		Credits: 4	
Course Code **20UMTC63**		Internal **25**	External **75**

COURSE OUTCOMES

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

CO1: convey the fundamental concepts in solving differential equations [K1]

CO2: explain the method of solving differential equations of higher degree, partial differential equations. [K2]

CO3: solve the problems choosing the most suitable methods and apply the techniques in the other fields. [K3]

CO4: analyse the special methods of solving ODE and PDE . [K4]

CO5: assess the solutions of ODE and PDE. [K5]

UNIT I

Equations of the First Order and of the First Degree

Linear Equation- Bernouilli's equation - Exact differential equations – Sufficient condition – Practical Rule for solving an exact differential equation – Rules for finding integrating factors. Solving First Order Differential Equations using MATLAB. (18 Hours)

UNIT II

Applications of First Order Equations

Growth, Decay and Chemical Reactions – Flow of water from an orifice – Falling Bodies and other rate problems – The Brachistochrone – Fermat and Bernoulli – Simple Electric Circuits – Dynamical Problems with variable mass. (18 Hours)

UNIT III

Equations of the First Order but of Higher Degree

Equations solvable for dy/dx - Equations solvable for y - Equations solvable for x- Clairaut's form.

Linear Equation with Constant Coefficients

Special methods for finding P.I – X is of the form $e^{ax}V$,where V is function of x – X is of the form x^m, m being a positive integer - Linear equation with variable coefficients - Equations reducible to the linear equations. Solving Second Order Differential Equations using MATLAB. (18 Hours)

UNIT IV

Linear Equations of the Second order

Complete Solution given a known integral – Reduction to the normal form – Change of the independent variable – Variation of Parameters. (18 Hours)

UNIT V

Partial Differential Equations of the first order

Classification of integrals - Derivation of partial differential equations - Lagrange's method of solving the linear equation- Special methods: Standard forms-Standard form I - Standard form-II - Standard form-III - Standard form-IV: Clairant's form. Solving Partial Differential Equations using MATLAB. (18 Hours)

TEXT BOOK:

Manickavasagam Pillai. T.K. and Narayanan. S. (2011), *Differential Equations and its Applications,* S.Viswanathan Publications, Reprint 2011.

Unit	Chapter	Section
I	2	4, 5 and 6.1 – 6.4.
II	3	1 – 7
III	4	1,2.1,2.2 and 3.1
	5	4.2 (c) , 4.2 (d) , 5 and 6
IV	8	1, 2, 3 and 4.
V	12	1, 2, 3, 4 and 5(5.1-5.4).

REFERENCE BOOKS:

1. Arumugam. S and Thangapandi Isaac.A(2003), *Differential Equations and Applications,* New Gamma Publishing House.
2. Raisinghania. M. D., Saxena. H. C., Dass. H.K.(2001), *Differential Equations,* S. Chand and Company Ltd., New Delhi.

Online Reference:

https://in.mathworks.com/help/symbolic/solve-a-single-differential-equation.html

Course Code 20UMTC63	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	H	H	M	H	H	H	L	M	M	-
CO2	H	H	M	M	H	H	L	M	M	-
CO3	H	H	M	M	H	H	M	M	M	-
CO4	H	H	M	M	H	H	M	M	M	-
CO5	H	H	M	M	H	H	M	M	M	-

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B.Sc. MATHEMATICS
(2020-21onwards)

Semester VI	**STATISTICS – II**	Hours/Week: 5	
Core Course-17		Credits: 4	
Course Code **20UMTC64**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: define the basic concepts in random variables, generating functions, some special distributions and sampling distributions. [K1]

CO2: explain the properties of special distributions and the theory of sampling distributions to find solutions of real life problems. [K2]

CO3: solve problems in random variables, generating functions, some special distributions and sampling distributions. [K3]

CO4: analyze the tests of hypothesis in the case of large and small samples to arrive at solid conclusion about the values of the population parameter. [K4]

CO5: examine the validity of the given statement about the values of population parameter and the homogeneity of several means using ANOVA techniques. [K5]

UNIT I

Random Variables

Introduction-Random Variables-Distribution function-Discrete Random Variable-Continuous Random Variable-Probability Density Function-Mathematical Expectations-Mathematical Expectation of continuous random variable. (15 Hours)

UNIT II

Random Variables

Moment generating function-properties of moment generating function-cumulant generating function-properties of cumulant generating function-Characteristic function

Some special distributions

Introduction-Binomial distribution-Poisson distribution-Normal distribution. (15 Hours)

UNIT III

Tests of significance (Large Samples)

Introduction-Sampling-Sampling distribution-Testing of hypothesis-Procedure for testing of hypothesis for large samples-Tests-of significance for large samples. (15 Hours)

UNIT IV

Tests of significance (Small Samples)

Introduction-Test of significance based on t-distribution (t-test)-Test of significance based on F-test-Test of significance of an observed sample correlation.

Test based on χ^2 - distribution

Introduction - χ^2 -Test - χ^2 -Test to test the goodness of fit-Test for independence of attributes. (15 Hours)

UNIT V

Analysis of Variance

Introduction-One criterion of classification-Two criteria of classification. (15 hours)

TEXT BOOK

Dr. Arumugam S. and Mr.Thangapandi Isaac. (July 2016), A *Statistics* New Gamma Publishing House.

UNIT	CHAPTER	SECTION
I	12	12.0 – 12.4
II	12	12.5,12.6
	13	13.0 – 13.3
III	14	14.0 – 14.5
IV	15	15.0 – 15.3
	16	16.0 - 16.3
V	17	17.0-17.2

REFERENCE BOOKS

1. Dr. S.P.Gupta, (1969), *Statistical Methods*, Sultan Chand & Sons.
2. S.C.Gupta, V.K.Kapoor, (2001), *Elements of Mathematical Statistics*, Sultan Chand & Sons.

Course Code 20UMTC64	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	H	H	H	H	H	M	M	M	H	M
CO2	H	H	H	H	H	M	H	M	H	M
CO3	H	H	H	H	H	H	H	M	H	M
CO4	H	H	M	H	H	M	H	M	H	L
CO5	H	H	M	H	H	M	H	M	H	L

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VIRUDHUNAGAR - 626 001

B.Sc. MATHEMATICS
(2020-21onwards)

Semester VI	**BOOLEAN ALGEBRA AND LATTICES**	Hours/Week: **5**	
DSEC -2		Credits: 4	
Course Code **20UMTE61**		Internal 25	External 75

COURSE OUTCOMES

On completion of the course, the learners will be able to

CO1: define Posets, different types of Lattices and Boolean Algebra. [K1]

CO2: explain the fundamental concepts and results in Posets, Lattices and Boolean Algebra. [K2]

CO3: apply the basic ideas in proving theorems and lemmas in Boolean Algebra. [K3]

CO4: analyze the relationship between Posets, Lattices, Boolean Algebra and its properties. [K4]

CO5: assess the algebraic structure of Posets, Lattices and Boolean Algebra. [K5]

Unit I

Posets and Lattices

Posets: Diagrammatical Representation of a Poset - Duality - Product of Two Posets - Lattices: Semi-lattices – Sublattices**.** (15 Hours)

Unit II

Modular and Distributive Lattices

Modular Lattices: Direct Products - Ideal Lattice - Isomorphism Theorem.

(15 Hours)

Unit III

Modular and Distributive Lattices

Distributive Lattices : Direct Products – Characterization Theorem for Distributive Lattice. (15 Hours)

Unit IV

Boolean Algebras

Representation of a Finite Boolean Algebra – Boolean Rings. (15 Hours)

Unit V

Boolean Algebras

Boolean Functions – Conjunctive Normal Form. (15 Hours)

Text Book :

Vijay K. Khanna(2018) *Lattices and Boolean Algebras*, New Delhi: Vikas Publishing House Pvt LTD.

Unit	Chapter	Sections/ Pages
I	2	11-15, 16-31, 33-35
II	4	70-82
III	4	82-94
IV	5	96-105, 107-111
V	5	111-124

REFERENCE BOOKS:

1. Elliott Mendelson (1967), *Theory and Problems of Boolean Algebra and Switching Circuits*, First Edition, Tata McGraw Hill Publishing Company Ltd., New Delhi.

2. Gupta M. K (2003), *Discrete Mathematics*, First Edition, Krishna Prakasam Media Pvt., Meerut.

3. Venkatraman M. K , Sridharan N, Chandrasekaran N(Reprint January 2011), *Discrete Mathematics*, National Publishing Company, Chennai.

Course Code 20UMTE61	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	H	H	M	H	M	M	M	L	-	-
CO2	H	H	M	H	M	M	M	L	-	-
CO3	H	H	M	H	M	M	M	L	-	-
CO4	H	H	M	H	H	M	M	L	-	-
CO5	H	H	M	H	H	M	M	L	-	-

Dr.A.Uma Devi

Head of the Department

Dr.P. Geetha

Course Designer

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B.Sc. MATHEMATICS
(2020-21onwards)

Semester VI	**OPTIMIZATION TECHNIQUES USING MATLAB**	Hours/Week: 5	
DSEC -2		Credits: 4	
Course Code **20UMTE62**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: define the basic concepts in duality, integer programming, replacement problems, Inventory control and Queueing theory. [K1]

CO2: explain the fundamental concepts in optimization techniques. [K2]

CO3: apply operation research techniques to solve contextual problems. [K3]

CO4: analyze various techniques, methods and algorithms in obtaining optimum solution to the solutions. [K4]

CO5: evaluate the optimal solution to problems in real life situations. [K5]

Unit I

Duality in Linear Programming

General Primal - Dual Pair - Formulating a dual problem – Primal-Dual pair in matrix form - Duality Theorems - Complementary slackness theorem - Duality and simplex method. Solving problems in Duality using MATLAB. (15 Hours)

Unit II

Integer Programming

Introduction – Pure and mixed integer programming problems – Gomory's ALL - I.P.P. method - Construction of Gomory's constraints – Fractional cut method : All Integer LPP – Fractional cut method : Mixed integer LPP – Branch and bound method. Solving problems in Integer Programming using MATLAB. (15 Hours)

Unit III

Replacement Problem and System Reliability

Introduction – Replacement of Equipment/Asset that deteriorates gradually – Replacement Policy when Value of Money does not change with time - Replacement Policy when Value of Money changes with time - Replacement of Equipment that fails suddenly.

(15 Hours)

Unit IV

Inventory Control – I

Introduction – Types of inventories – Reasons for carrying inventories - The inventory Decisions – Objectives of scientific inventory control – Costs associated with inventories – Factors affecting inventory control – An inventory control problem – The concept of EOQ – Deterministic inventory problems with no shortages - Deterministic inventory problem with shortages. (15 Hours)

Unit V

Queueing Theory

Introduction – Queueing system – Elements of a queueing system – Operating characteristics of a Queueing system – Deterministic Queueing system – Probability distributions in Queueing systems – Classification of Queueing models – Definition of transient and steady states – Poisson Queueing Syatems: Model I{(M/M/1):(∞/FIFO)}, Model II{(M/M/1):(∞/SIRO)}, Model III{(M/M/1):(N /FIFO)}. Solving problems in Queuing Theory using MATLAB. (15 Hours)

Textbook

Kanti Swarup, Gupta. P.K., ManMohan(Reprint 2014), *Operations Research*, Sultan Chand & Sons, Educational Publishers, New Delhi.

Unit	Chapter	Section
I	5	5.2 - 5.7
II	7	7.1 - 7.7
III	18	18.1 - 18.3
IV	19	19.1 - 19.11
V	21	21.1 – 21.9 (upto Model III, Page No:610)

REFERENCE BOOKS:

1. Gupta. P. K and Man Mohan (2003), *Problems in Operations Research(Methods & solutions),*Sultan Chand & Sons, Educational Publishers, New Delhi.

2. Sharma. S. D (2009), *Operations research*, Kedar Narth Ram Nath , New Delhi.

Course Code 20UMTE62	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	H	H	L	H	M	H	H	H	H	L
CO2	H	H	L	H	M	H	H	H	H	L
CO3	H	H	L	H	M	H	H	H	H	L
CO4	H	H	L	H	M	H	H	H	H	L
CO5	H	H	L	H	M	H	H	H	H	L

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B.Sc. MATHEMATICS
(2020-21onwards)

Semester VI	**ASTRONOMY**	Hours/Week: 5	
DSEC -2		Credits: 4	
Course Code **20UMTE63**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: define various trigonometric formulas for spherical triangles. [K1]

CO2: explain the Kepler's law of planetary motion, the motion of planets around the sun. [K2]

CO3: apply the acquired knowledge about the motion of celestial objects to the society. [K3]

CO4: analyze the effect of refraction takes place in celestial bodies. [K4]

CO5: determine astronomical distance using parallax technique. [K5]

UNIT I

Spherical Trigonometry

Sphere- Great circles and small circles-Axis and poles of a circle-Distance between two points on a sphere-Angle between two circles-Angular radius or spherical radius-Spherical figures-spherical Triangle-Polar Triangle- Relation between the elements of a spherical triangle and its polar triangle-Some properties of spherical triangles-Principle of duality- Colunar and antipodal triangle-Relations between the sides and angles of a spherical triangle-Cosine formula - Sine formula-Cotangent formula-Supplemental cosine formula-Five parts formula-Functions of half an angle- Functions of half a side- Delambre's analogies-Napler's analogies-Right angled spherical triangle-Napier's Rules-Spherical co-ordinates-Relation between the spherical and rectangular coordinates-General proof of the cosine formula-Small variations-Formulae in plane Trigonometry-Important Note-Problems-Theorem(statements only). (15 Hours)

UNIT II

Celestial Sphere, Diurnal Motion

Astronomy – Celestial sphere-Diurnal motion, celestial axis and equator-Celestial Horizon-Zenith and Nadir-Celestial Meridian-Cardinal points-North and southern hemispheres-Eastern and western hemispheres-Visible and invisible hemispheres-Declination circles-Verticals-Parallactic angle-Transit or culmination-Due east and due west-Due south and due north-Annual motion of the sun, Ecliptic, Obliquity-First point of Aries and First point of Libra-Equinoxes and solstices-Colures.

Celestial Co-ordinates

Horizontal system-Equatorial system-Meridian system-Ecliptic system-To represent the different system of co-ordinates in the same figure-Conversion of co-ordinates-To find the relation between Right Ascension and longitude of the sun-To trace the changes in the co-ordinates of the sun in the course of a year-To find the longitude of the sun on any day-Problems-Sidereal times-West hour angle of a body expressed in time units-Theorem (statements only).

Diurnal Motion

To find the duration of day time – To find the azimuth of a star at rising -To trace the changes in the azimuth of a star in the course of a day-Problems.

Time for Rising

Morning and Evening stars-Circumpolar stars-To find the condition that a star is circumpolar- To find the sidereal time of sunrise when the longitude of the sun on the date is known-To find the daily retardation in the sidereal time of sunrise-Problems-Theorem(Statement only). (15 Hours)

UNIT III

The Earth

Dip of Horizon – To find an expression for Dip-To find the distance between two mountains whose tops are just visible from each other- Effects of Dip-To find the acceleration in the time of rising of a star due to dip-Problems-Twilight-To find the duration of twilight-To find the condition that twilight may last throughout night-To find the number of consecutive days having twilight throughout night-To find the duration of twilight when it is shortest-Civil, nautical and astronomical twilights-Problems.

Geocentric Parallax

Parallax-Effects of geocentric parallax-Changes in R.A. and declination of a body due to geocentric parallax-Effect of geocentric parallax on the rising and setting of a celestial body-To find the horizontal parallax of moon by meridian observations-To find the distance of a body when its horizontal parallax is known-Angular diameter-To show that the angular radius of a body varies inversely as its distance from the observer-To find the relation between horizontal parallax and angular radius of a body-Geocentric parallax and Refraction compared-Equatorial horizontal Parallax-Problems. (15 Hours)

UNIT IV

Refraction

Refraction – Laws of refraction-Astronomical refraction-Tangent formula for refraction-General effects of refraction-To find k-Effects of refraction on the rising and setting of celestial bodies-To find the effect of refraction on the R.A. and declination of a star-To find the effect of refraction on a small horizontal arc-To find the effect of refraction on a small vertical arc-To find the effect of refraction on any small arc-Effect of refraction on the shape of the disc of the sun or full moon-Cassini's Formula-To find Cassini's constants A and B-Horizontal Refraction- To find the acceleration in the time of rising of a body due to refraction-Effect of Refraction on Dip and distance of visible horizon-Influence of temperature and pressure of atmosphere on Refraction-Problems. (15 Hours)

UNIT V

Kepler's Laws

Kepler's laws of planetary motion-Longitude of perigee-Forward motion of the apse line-To calculate the eccentricity of the earth's orbit around the sun-Verification of Kepler's laws (1) and (2) in the case of the earth-Explanation of third law-Radial and transverse accelerations of a particle describing a plane curve in polar co-ordinates-Newton's deductions from Kepler's laws-To derive Kepler's third law from Newton's law of gravitation-To find the mass of a planet-To fix the position of a planet in its elliptic orbit-To express v as a series of u –Mean Anomaly-To prove $m = u - e \sin u$ – To express u as a series in m –To express v in terms of m- To Express m in terms of v – To express the R.A. of sun in terms of its longitude-Geocentric and Heliocentric latitudes and longitudes-To prove that the heliocentric longitude of the earth and geocentric of the sun differ by 180° – Problems. (15 Hours)

Text Book

Prof.Kumaravelu and Prof. Susheela Kumaravelu (Revised Edition 2011) *Astronomy.* Nagercoil: Rainbow Printers.

Unit	Chapter	Section
I	I	1-38
II	II	39-68,77-79,80-85
III	III,V	106-116,135-145
IV	IV	117-134
V	VI	146-165

REFERENCE BOOKS:

1. Lisa Miles, *Complete Book of Astronomy and Space* (August 1st 1998), E.D.C. Publishing**.**
2. Deepak Kapoor, *Astronomy and Mathematical Astrology* (98th reprint 2011 edition (1 January 1995), Vinita Kapoor publishers.

Course Code 20UMTE63	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	H	H	L	L	M	L	M	H	L	H
CO2	H	H	L	L	M	L	M	H	L	H
CO3	H	H	L	L	M	L	M	H	L	H
CO4	H	H	L	L	M	L	M	H	L	H
CO5	H	H	L	L	M	L	M	H	L	H

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B.Sc. MATHEMATICS
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Semester VI	**STATISTICS USING R**	Hours/Week: 2	
SEC-6		Credits: 2	
Course Code **20UMTS61P**		Internal 40	External 60

COURSE OUTCOMES

On completion of the course, students will be able to

CO1: illustrate the given data with the ggplot2 package in R. [K3]

CO2: demonstrate R Programme to calculate the Statistical parameters. [K3]

CO3: apply R Programming for Statistical perspectives. [K3]

CO4: calculate probability distributions to solve a wide variety of problems using R. [K3**]**

CO5: examine the various significance tests and ANOVA using R. [K4]

List of Practical Programs in R:

1. Develop a program to calculate mean, median, mode, standard deviation, variance minimum value, maximum value, quartile, interquartile range.
2. Write a program to present the data in tabulation and graphical representation.
3. Develop a program in R using t –test.
4. Develop a program in R using F –test.
5. Develop a program in R using chi-square test.
6. Develop a program to calculate one way ANOVA
7. Develop a program to calculate pdf and cdf for some special distributions.
8. Develop a program to calculate correlation.
9. Develop a program to find the regression lines.
10. Develop a program to find the moment generating functions in R.

Course Code 20UMTS61P	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO1	H	H	M	M	M	L	L	H	M	-
CO2	H	H	M	M	M	L	L	H	M	-
CO3	H	H	M	M	M	L	L	H	M	-
CO4	H	H	M	M	M	L	L	H	M	-
CO5	H	H	M	M	M	L	L	H	M	-

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