# HAJEE KARUTHA ROWTHER HOWDIA COLLEGE

(An Autonomous Institution Affiliated to Madurai Kamaraj University, Madurai.)
Re-Accredited with A++ Grade by NAAC (3rd Cycle)
**Uthamapalayam - 625 533.**

## DEPARTMENT OF MATHEMATICS

BACHELOR OF SCIENCE - MATHEMATICS

SYLLABUS

Choice Based Credit System – CBCS

With

Outcome Based Education (OBE)

(Academic Year 2026 - 2027 onwards)

# HAJEE KARUTHA ROWTHER HOWDIA COLLEGE

(An Autonomous Institution Affiliated to Madurai Kamaraj University, Madurai.)
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## College Vision and Mission

### Vision

Our vision is to provide the best type of higher education to all, especially to students hailing from minority Muslim community, rural agricultural families and otherdeprived, under privileged sections of the society, inculcating the sense of social responsibility in them. Our college is committed to produce talented, duty-bound citizens to take up the challenges of the changing times.

### Mission

Our mission is to impart and inculcate social values, spirit of service and religious tolerance as envisioned by our beloved Founder President Hajee Karutha Rowther.

The Vision beckons .....the Mission continues forever.

# HAJEE KARUTHA ROWTHER HOWDIA COLLEGE

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## Department Vision and Mission

### Vision

Department of Mathematics will promote and support a comprehensive, innovative and dynamic learning environment that meets the changing needs ofa diverse global students population prepare the young minds for the rapidly changing mathematical techniques.

### Mission

The mission of the mathematics degree program is to equip students with analytic and problem solving skill for career and graduate work classes develop student abilities and aptitudes to apply mathematical methods and ideas notonly to problems in mathematics and related field such as the science, computer science, statistics but also to virtually any area of inquiry students learn to communicate ideas effectively and they are encouraged to develop intellectually and to become involved with professional origination. The department cooperates fully with the school of education in meeting its mission for candidates for a degree in education with mathematics.

## Programme Educational Objectives (PEO)

Our graduates will be progressive, efficient, value based, academically excellent, creative, collaborative, empowered and globally competent literates with the skills required for societal change.

They will demonstrate

| | |
|---|---|
| **PEO1** | Comprehensive knowledge and expertise, employability, the acumen of creative and critical thinking, the spirit of enquiry and professional attituderequired for a successful career |
| **PEO2** | Accountability, linguistic competence and communication skills in the work environment and beyond |
| **PEO3** | Perseverance, effective collaboration, team spirit, leadership and problem solving skills |
| **PEO4** | Keen sense of civility, professional ethics, receptivity and moral Righteousness |
| **PEO5** | Commitment to address social and environmental threats and to act as responsible service-minded, duty-bound global citizens |

## Programme Outcomes (PO)

On completion (after three years) of B.Sc. Mathematics programme, the students are able to

| | |
|---|---|
| **PO1** | Acquire good knowledge and understanding in areas of Mathematics and Concepts in various domains of science and technology. |
| **PO2** | Identify and analyze the problem and formulate solutions for problems using The principles of Mathematics. |
| **PO3** | Provide sufficient knowledge and skills enabling them to undertake furtherstudies in Mathematics and its allied areas on multiple disciplines concerned With Mathematics. |
| **PO4** | Equip them with Mathematical modeling abilities, problem solving skills, Creative talent and power of communication necessary for various kinds of employment. |
| **PO5** | Enable them to prepare themselves for higher education through the abstract and mathematical structure in the courses prescribed. |

## Programme Specific Outcomes (PSO)

A graduate of B.Sc. Mathematics after three years will

| | |
|---|---|
| **PSO1** | Communicate Mathematics effectively using various instructional strategies. |
| **PSO2** | Utilize skills to write the proof of Mathematical Statements in a Suitable manner and solve theoretical applied problems |
| **PSO3** | Acquire computation, Programming and software skill to get Empowered With Employability and Entrepreneurial skills. |
| **PSO4** | Develop Confidence To Defend The Various Level Of Competitive Examination and Get Opportunities For Personal And Career Development. |
| **PSO5** | Acquire Knowledge Of The Emerging Environmental Challenges and Provide The Possible Contribution In Sustainable Development That Integrates Environment, Economy, Society and The Nation. |

**Programme Scheme**

**Eligibility**

A Pass in +2 examination conducted by Board of Higher Secondary Education, Government of Tamilnadu or equivalent with Mathematics as one of the subjects.

**For Programme Completion**

A Candidate shall complete:

- Part I - Language Courses – Tamil/Arabic/Malayalam in semesters I, II, III and IV respectively
- Part II - Language Courses - English in semesters I, II, III, IV respectively
- Part III - Core Courses in semesters I, II, III, IV, V and VI respectively
- Part III - Generic Elective Courses in semesters I, II, III and IV respectively
- Part III - Discipline Elective Courses in semesters IV, V and VI respectively
- Part IV - Foundation Course (Skill Enhancement Course) in Semester I
- Part IV - Entrepreneurial Skills (Skill Enhancement Course) Course in Semester III
- Part IV - Professional Competency Skill (Skill Enhancement Course) Course in Semester V
- Part IV – Non Major Elective (Skill Enhancement Course) Courses in Semesters V and VI respectively
- Part IV - Environmental Studies Course in semester I
- Part IV - Value Education Course in semester III
- Part IV - Summer Internship/Industrial Training Course in semester V
- Part V - Extension activity in semester IV

**Scheme of Examinations under Choice Based Credit System**

| | |
|---|---|
| Term End Examinations (TEE) | - 75 Marks |
| Continuous Internal Assessment Examinations (CIAE) | - 25 Marks |
| Total | - 100 Marks |

**Pattern of Continuous Internal Assessment Examinations (CIAE)**

| | |
|---|---|
| Average of Two Internal Tests (each 20 marks) | - 20 Marks |
| Assignment | - 05 Marks |
| Total | - 25 Marks |

**Pattern of Term End Examinations**
**(Max. Marks: 75 / Time: 3 Hours)**

**External Examinations Question Paper Pattern for Part I & III and Part IV (Non- Major Elective & Skill based Subject)**

**Section – A (5 X 1 = 5 Marks)**
Answer ALL questions.
- Questions 1 - 5
- One question from each unit
- Multiple choice questions and each question carries Four choices

**Section – B (5 X 2 = 10 Marks)**
Answer ALL questions.
- Questions 6 - 10
- One question from each unit
- Short Answer (Definition)

**Section – C (5 X 6 = 30 Marks)**
Answer any ALL questions (Choose either a or b).
- Questions 11 - 15
- One question from each unit
- Paragraph

**Section – D (3 X 10 = 30 Marks)**
Answer any THREE out of five questions**.**
- Questions 16 - 20
- One question from each unit
- Essay type

**External Examinations Question Paper Pattern for Part IV-**
**Foundation Course**
- MCQ Pattern (1 X 75 = 75 Marks)

**External Examinations Question Paper Pattern for Part IV-**
**Environmental Studies and Value Education**

**Section – A: (5 X 6 = 30 Marks)**
Answer ALL questions choosing either A or B.
- Questions 1 - 5
- Two questions from each unit (either…. or…. type)
- Paragraph

**Section – B (3 X 15 = 45 Marks)**
Answer any THREE out of five questions.
- Questions 6 – 10
- One question from each unit
- Essay type

**Part V (Extension Activities) – 13 Activities**
- Internal Evaluation

**Passing Marks**
Minimum 27 for External Exam
Eligibility for the degree – passing minimum is **40%**

**Practical Examination**
Internal – 40 marks
External – 60 marks (minimum 24 marks)
Total – 100 marks
Passing minimum is **40%**

**Weightage**

| Weightage for Bloom's Taxonomy | Percentage | Marks | |
|---|---|---|---|
| | | CIAE | TEE |
| Knowledge (Remembering) – K1 | 15 | 4 | 11 |
| Understanding – K2 | 20 | 5 | 15 |
| Applying – K3 | 25 | 6 | 19 |
| Analyzing – K4 | 40 | 10 | 30 |
| **Gross Total** | **100** | **25** | **75** |

**Assessment**
**Distribution of questions and marks for Continuous Internal Assessment Examinations**

| Bloom's Taxonomy | Section A | Section B | Section C | Section D | Total |
|---|---|---|---|---|---|
| Knowledge(K1) | 2(2) | 2(2) | - | - | **25 marks** |
| Understanding(K2) | **Assignment (5)** | | | | |
| Apply(K3) | - | - | 2(6) | - | |
| Analyzing (K4) | - | 2(2) | - | 1(8) | |

**Distribution of questions and marks for Term End Examinations.**

| Bloom's Taxonomy | Section A | Section B | Section C | Section D | Total |
|---|---|---|---|---|---|
| Knowledge(K1) | 1(1) | 2(4) | 1(6) | - | **Total 75 Marks** |
| Understanding(K2) | 1(1) | 1(2) | 2(12) | - | |
| Apply(K3) | 3(3) | 2(4) | 2(12) | - | |
| Analyzing (K4) | - | - | - | 3(30) | |

**Note: Figures in parenthesis are Marks**

## Credits Distribution

| S. No | Part | Category | No of Courses | No of Credits |
|---|---|---|---|---|
| 1 | Part - I | Language | 4 | 12 |
| 2 | Part - II | English | 4 | 12 |
| 3 | Part - III | Core (Theory / Practical / Project) | 17 | 69 |
| | | Discipline Elective (Theory / Practical) | 4 | 14 |
| | | Generic Elective (Theory / Practical *) | 6 | 16 |
| 4 | Part - IV (AEC) | Foundation Course | 1 | 2 |
| | | EVS | 1 | 2 |
| | | Value Education | 1 | 2 |
| | | NME | 2 | 4 |
| 5 | Part - IV (SEC) | Entrepreneurial Skills | 1 | 2 |
| | | Professional Competency | 1 | 2 |
| | | Internship | 1 | 2 |
| 6 | Part - V | Extension Activity | 1 | 1 |
| **Total** | | | **44** | **140** |

* Generic Elective Practical Examinations should be Conducted only in Even Semester

## B.Sc., MATHEMATICS
## Details of Course Category, Code, Credits & Title

| Course Category | Course Code | Course Title | Hrs | CIAE | TEE | Max. Marks | Credits |
|---|---|---|---|---|---|---|---|
| **Semester - I** | | | | | | | |
| **Part - I** | | | | | | | |
| Language - I | 26UTALL11 | பொதுத்தமிழ் - I | 6 | 25 | 75 | 100 | 3 |
| | 26UARLL11 | Introduction to Arabic Language - I | | | | | |
| | 26UMMLL11 | History of Malayalam Literature | | | | | |
| **Part – II** | | | | | | | |
| English - I | 26UENLL11 | General English - I | 6 | 25 | 75 | 100 | 3 |
| **Part – III** | | | | | | | |
| Core – I | 26UMACC11 | Calculus | 5 | 25 | 75 | 100 | 5 |
| Core – II | 26UMACC12 | Trigonometry | 3 | 25 | 75 | 100 | 3 |
| Generic Elective - I | 26UPHGE11 | Allied Physics – I | 4 | 25 | 75 | 100 | 3 |
| Generic Elective – II (Lab) | 26UPHGE2P | Allied Physics Practical | 2 | - | - | - | - |
| **Part – IV** | | | | | | | |
| Foundation Course (SEC)(MCQ) | 26UMAFN11 | Foundation Course in Mathematics | 2 | 25 | 75 | 100 | 2 |
| EVS | 26UGEVS11 | Environmental Studies | 2 | 25 | 75 | 100 | 2 |
| **TOTAL** | | | **30** | | | | **21** |

| Course Category | Course Code | Course Title | Hrs | CIAE | TEE | Max. Marks | Credits |
|---|---|---|---|---|---|---|---|
| **Semester - II** | | | | | | | |
| **Part - I** | | | | | | | |
| Language – II | 26UTALL21 | பொதுத்தமிழ் - II | 6 | 25 | 75 | 100 | 3 |
| | 26UARLL21 | Introduction to Arabic Language - II | | | | | |
| | 26UMMLL21 | Prose, Composition & Translation | | | | | |
| **Part – II** | | | | | | | |
| English - II | 26UENLL21 | General English - II | 6 | 25 | 75 | 100 | 3 |
| **Part – III** | | | | | | | |
| Core – III | 26UMACC21 | Analytical Geometry | 5 | 25 | 75 | 100 | 5 |
| Core – IV (Lab) | 26UMACC2P | Calculus Using Maxima Lab | 3 | 40 | 60 | 100 | 3 |
| Core – V | 26UMACC22 | Vector Calculus and Applications | 4 | 25 | 75 | 100 | 4 |
| Generic Elective - II | 26UPHGE21 | Allied Physics – II | 4 | 25 | 75 | 100 | 3 |
| Generic Elective – II (Lab) | 26UPHGE2P | Allied Physics Practical | 2 | 40 | 60 | 100 | 2 |
| **TOTAL** | | | **30** | | | | **23** |

| Course Code | Course Title | Category | Hours | Credits | Marks | | |
|---|---|---|---|---|---|---|---|
| | | | | | CIAE | TEE | Total |
| **26UMACC11** | **CALCULUS** | **Core - I** | **5** | **5** | **25** | **75** | **100** |

| **Course Objectives** | | |
|---|---|---|
| This course deals with fundamental concepts of the basic skills of differentiation, successive differentiation and their applications. It enables us to examine the theoretical knowledge of double and triple integrals. | | |
| **UNIT** | **Contents** | **No. of Hours** |
| **I** | Introduction – The $n^{th}$ derivative – Standard results – Fractional expressions – Trigonometrical transformation – Formation of equations involving derivatives–Leibnitz formula for the $n^{th}$ derivative of a product. | 15 |
| **II** | Partial derivatives–Successive partial derivatives–Function of a function rule – Total differential coefficient – A special case – Implicit Functions- Homogeneous functions– Partial derivatives of a function of two variables. | 15 |
| **III** | Reduction formulae -Types, integration of product of powers of algebraic and trigonometric functions, integration of product of powers of algebraic and logarithmic functions - Bernoulli's formula. | 15 |
| **IV** | Multiple Integrals: Definition of double integrals –Evaluation of double integrals – double integrals in polar coordinates - Change of order of integration. | 15 |
| **V** | Triple integrals – applications of multiple integrals - volumes of solids of revolution - areas of curved surfaces. | 15 |
| | **Total** | **75** |

| **Course Outcomes** | | **Knowledge Level** |
|---|---|---|
| **CO** | **On completion of this course, students will** | |
| 1 | Find the nth derivative, form equations involving derivatives and apply Leibnitz formula. | K1,K2,K3,K4 |
| 2 | Use partial derivative and total derivative coefficient. | K1,K2,K3,K4 |
| 3 | Able to solve the problems of reduction formula. | K1,K2,K3,K4 |
| 4 | Determine double integral and double integrals in polar coordinates. | K1,K2,K3,K4 |
| 5 | Demonstrate the Triple integrals – Applications of multiple integrals . | K1,K2,K3,K4 |

**K1-Knowledge K2-Understand K3-Apply K4-Analyze**

| | |
|---|---|
| **Text Books** | |
| 1. | Manikavachagam Pillay.T.K. and Natarajan.T, "***Calculus - Volume I "***, Viswanathan (Printers & Publishers) Pvt Ltd,Chennai,1997(Unit-I&II). |
| 2. | Manikavachagam Pillay.T.K. and Natarajan.T, "***Calculus - Volume II "***, Viswanathan (Printers & Publishers) Pvt Ltd,Chennai,1997(Unit-III,IV and V). |
| **Reference Books** | |
| 1. | H. Anton, I. Birens and S. Davis, ***Calculus***, John Wiley and Sons, Inc., 2002.. |
| 2. | G.B. Thomas and R.L. Finney, ***Calculus***, Pearson Education, 2010. |
| **e-Resources** | |
| 1. | https://nptel.ac.in |

**Mapping with Programme Outcomes:**

| CO /PO | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 1 | 2 | 3 |
| **CO2** | 2 | 3 | 1 | 3 | 1 |
| **CO3** | 1 | 2 | 2 | 3 | 1 |
| **CO4** | 2 | 3 | 3 | 1 | 2 |
| **CO5** | 3 | 1 | 2 | 2 | 3 |

**Strong-3 Medium-2 Low-1**

**Level of Correlation between PSO's and CO's**

| CO /PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 2 | 3 | 1 |
| **CO2** | 2 | 3 | 1 | 2 | 2 |
| **CO3** | 1 | 3 | 2 | 2 | 3 |
| **CO4** | 3 | 1 | 2 | 3 | 1 |
| **CO5** | 1 | 3 | 2 | 1 | 3 |

**Strong-3 Medium-2 Low-1**

**COURSE CONTENTS AND LECTURE SCHEDULE**

| Module No. | Topic | No. of Lectures |
|---|---|---|
| **UNIT - I** | | |
| 1.1 | The $n^{th}$ derivative – Standard results | 3 |
| 1.2 | Fractional expressions – Trigonometrical transformation | 4 |
| 1.3 | Formation of equations involving derivatives | 4 |
| 1.4 | Leibnitz formula for the $n^{th}$ derivative of a product | 4 |
| **UNIT - II** | | |
| 2.1 | Partial derivatives–Successive partial derivatives– | 3 |
| 2.2 | Function of a function rule–Total differential coefficient | 4 |
| 2.3 | A special case –Implicit Functions | 4 |
| 2.4 | Homogeneous functions– Partial derivatives of a function of | 4 |

| | | |
|---|---|---|
| | two variables | |
| **UNIT - III** | | |
| 3.1 | Reduction formulae -Types | 4 |
| 3.2 | Integration of product of powers of algebraic and logarithmic functions | 4 |
| 3.3 | Bernoulli's formula. | 4 |
| 3.4 | Problems | 3 |
| **UNIT - IV** | | |
| 4.1 | Multiple Integrals - definition of double integrals | 4 |
| 4.2 | Evaluation of double integrals | 4 |
| 4.3 | double integrals in polar coordinates | 5 |
| 4.4 | Change of order of integration | 2 |
| | | |
| **UNIT - V** | | |
| 5.1 | Triple integrals–applications of multiple integrals | 5 |
| 5.2 | Volumes of solids of revolution | 5 |
| 5.3 | Areas of curved surfaces | 5 |
| **Total** | | **75** |

**Course Designer:**
**Name: Dr. P. Anitha**
Assistant Professor of Mathematics

| Course Code | Course Title | Category | Hours | Credits | Marks | | |
|---|---|---|---|---|---|---|---|
| | | | | | CIAE | TEE | Total |
| **26UMACC12** | **TRIGONOMETRY** | **Core-II** | **3** | **3** | **25** | **75** | **100** |

**Course Objectives**

Trigonometry deals with the applications of De Moivre's theorem, hyperbolic functions, summation of series and logarithm of complex numbers.

| UNIT | Contents | No. of Hours |
|---|---|---|
| **I** | Expansions of sin nθ and cos nθ - Series for sin θ and cos θ in powers of θ – Expansions of sine and cosine of an angle in series of ascending powers of the angle – Approximate value of the root of an equation. | 9 |
| **II** | Expansions of sines and cosines of multiple angles and of powers of sines and cosines – Expand sinnθ/sinθ and cosnθ in a series of ascending and descending powers of cos θ – related problems. | 9 |
| **III** | Exponential series for complex Quantities - Circular functions for complex angles – Periods of complex circular functions - Hyperbolic Functions – inverse circular functions – inverse Hyperbolic Functions. | 9 |
| **IV** | Logarithm of Complex Quantities – Definition - Definition of $a^x$ – separate into real and imaginary parts - Simple problems. | 9 |
| **V** | Summation of series and Expansion in series - C+iS method – Expansions and related problems. | 9 |
| | **Total** | **45** |

| Course Outcomes | | Knowledge Level |
|---|---|---|
| **CO** | **On completion of this course, students will** | |
| 1 | Recall expressions and expansions for trigonometric functions. | K1,K2,K3,K4 |
| 2 | Expand trigonometric functions involving multiple angles | K1,K2,K3,K4 |
| 3 | Relate circular trigonometric functions and hyperbolic Functions. | K1,K2,K3,K4 |
| 4 | Basic concepts in complex numbers and their related Problems. | K1,K2,K3,K4 |
| 5 | Able to solve problems on summation of series using C+iS method. | K1,K2,K3,K4 |

**K1-Knowledge K2-Understand K3-Apply K4-Analyze**

**Text Books**

1. S. L. Loney, "***Plane Trigonometry- Part-II***" Cambridge University Press, Macmillan and co. limited

**Reference Books**

1. Arumugam. S., and Thangapandi Isaac, A., "***Algebra: Theory of Equations Theory of Numbers and Trigonometry"***, New Gamma Publishing House, Palayamkottai, 2011

| | |
|---|---|
| 2. | Rawat, K.S., "***Trigonometry",*** First Edition, Sarup Book Publishers Pvt. Ltd., New Delhi. 2008 |
| 3. | Khanna.M.L., "***Trigonometry***" Jai Prakash Nath & Co.,Educational Publishers, Meerut, 1988. |
| **e-Resources** | |
| 1. | https://nptel.ac.in |

**Mapping with Programme Outcomes:**

| CO /PO | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 1 | 3 | 3 |
| **CO2** | 3 | 3 | 1 | 3 | 3 |
| **CO3** | 3 | 3 | 2 | 3 | 3 |
| **CO4** | 3 | 3 | 2 | 3 | 3 |
| **CO5** | 3 | 3 | 2 | 3 | 3 |

**Strong-3 Medium-2 Low-1**

**Level of Correlation between PSO's and CO's**

| CO /PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 1 | 3 | 3 |
| **CO2** | 3 | 3 | 1 | 3 | 3 |
| **CO3** | 3 | 3 | 2 | 3 | 3 |
| **CO4** | 3 | 3 | 2 | 3 | 3 |
| **CO5** | 3 | 3 | 2 | 3 | 3 |

**Strong-3 Medium-2 Low-1**

**COURSE CONTENTS AND LECTURE SCHEDULE**

| Module No. | Topic | No. of Lectures |
|---|---|---|
| **UNIT - I** | | |
| 1.1 | Expansions of sin nθ and cos nθ | 3 |
| 1.2 | Series for sin θ and cos θ in powers of θ | 2 |
| 1.3 | Expansions of sine and cosine of an angle in series of ascending powers of the angle | 2 |
| 1.4 | Approximate value of the root of an equation. | 2 |
| **UNIT - II** | | |
| 2.1 | Expansions of sines and cosines of multiple angles and of powers of sines and cosines | 3 |
| 2.2 | Expand sin nθ/sin θ and cos nθ in a series of ascending and descending powers of cos θ | 3 |
| 2.3 | Problems | 3 |
| **UNIT - III** | | |
| 3.1 | Exponential series for complex Quantities | 2 |

| | | |
|---|---|---|
| 3.2 | Circular functions for complex angles | 2 |
| 3.3 | Periods of complex circular functions | 1 |
| 3.4 | Hyperbolic Functions | 2 |
| 3.5 | Inverse circular functions and Hyperbolic Functions. | 2 |
| **UNIT - IV** | | |
| 4.1 | Logarithm of Complex Quantities – Definition | 3 |
| 4.2 | Definition of $a^x$ – separate into real and imaginary parts | 3 |
| 4.3 | Simple problems. | 3 |
| **UNIT - V** | | |
| 5.1 | Summation of series | 3 |
| 5.2 | C+iS method | 3 |
| 5.3 | Expansions and related problems. | 3 |
| **Total** | | **45** |

**Course Designer:**
**Name: N. Rayshima**
Assistant Professor of Mathematics

| Course Code | Course Title | Category | Hours | Credits | Marks | | |
|---|---|---|---|---|---|---|---|
| | | | | | CIAE | TEE | Total |
| **26UPHGE11** | **ALLIED PHYSICS – I** | **Generic Elective – I** | **4** | **3** | **25** | **75** | **100** |

| **Course Objectives** | | |
|---|---|---|
| To impart basic laws governing mechanics, thermal phenomena, sound waves, electricity and magnetism. It emphasizes clear understanding of fundamental principles and their applications. | | |
| **UNIT** | **Contents** | **No. of Hours** |
| **I** | **FORCE, WORK, POWER AND ENERGY:**<br>Basic forces in nature – types of forces – gravitational force, electromagnetic force and nuclear forces – conservative and non-conservative forces – laws of friction – friction, coefficient and angle of friction – motion of bodies along an inclined plane – work – work done by varying force – Expression for kinetic energy and potential energy – Power. | 12 |
| **II** | **PROPERTIES OF MATTER:**<br>**ELASTICITY**:<br>Stress – strain – modulus of elasticity – elastic constants – bending of beam – theory of uniform bending – theory of non – uniform bending – determination of Young's modulus by uniform and non – uniform bending – Energy stored in a stretched wire – torsion of a wire – determination of rigidity modulus by torsional pendulum<br>**VISCOSITY**:<br>Streamline and turbulent motion – critical velocity – coefficient of viscosity – Derivation of Poisiuille's formula (analytical method)– Bernoulli's theorem proof – Applications – Venturimeter – Pitot tube | 12 |
| **III** | **SOUND:**<br>Simple harmonic motions – progressive waves properties – composition of two S.H.M. and beats stationary waves – properties – Beats – acoustics requisites for good auditorium – ultrasonic – production, detection and application. | 12 |
| **IV** | **HEAT TRANSFER:**<br>Conduction, convection and radiation – thermal conductivity – Lee's disc method for conductivity of bad conductor – analogy between heat flow and electric current – Weidman-Franz law – convection in atmosphere – lapse rate – Stefan's law – determination of Stefan's constant by filament heating method – solar constant measurement – water flow pyrheliometer – temperature of the Sun | 12 |
| **V** | **ELECTRICITY AND MAGNETISM:**<br>Electric charge - electric field – electric potential – Ohm's law - | 12 |

| | | |
|---|---|---|
| | potentiometer – principle – comparison of emf of two cells – calibration of ammeter and voltmeter (low range) – Biot-Savart's law - magnetic field due to a current carrying long conductor – magnetic Field along the axis of the coil carrying current – peak, average and root mean square (RMS) values of ac current and voltage – power. | |
| **Total** | | **60** |

| **Course Outcomes** | | **Knowledge Level** |
|---|---|---|
| **CO** | **On completion of this course, students will** | K1, K2, K3 |
| 1 | Analyze the laws of motion and central force. | K1, K2, K3 |
| 2 | Explain their knowledge of understanding about materials and their behaviors and apply it to various situations in laboratory and real life. | K1, K2, K3 |
| 3 | Explain the Properties of Sound, acoustics and ultrasonic waves. | K1, K2, K3 |
| 4 | Describe the three modes of heat transfer and their governing laws with applications. | K1, K2, K3,K4 |
| 5 | Explain the principles of electricity and magnetism and apply them to analyze AC circuits, measuring instruments, and electrical power. | K1, K2, K3,K4 |

**K1-Knowledge, K2-Understand, K3-Apply, K4- Analyze**

**Textbooks**

| | |
|---|---|
| 1. | R. Murugeshan, Mechanics, ***Properties of Matter and Sound*** - Shantha publications, (2002) |
| 2. | R. Murugeshan, ***Allied Physics***, S. Chand and Co, (2001). |
| 3 | R. Murugeshan, ***Electricity and Magnetism***, S.Chand and Co, (2001). |
| 4 | R. Murugeshan, ***Allied Physics-III*** S. Chand and Co, (2001). |

**Reference Books**

| | |
|---|---|
| 1. | Resnick Halliday and Walker ***Fundamentals of Physics***, John Willey and Sons, Asia Pvt. Ltd., 11thedition (2018). |
| 2 | V. R. Khanna and R. S. Bedi, ***Text book of Sound***, Kedharnaath Publish and Co, 1stedition (1998) |
| 3 | N.S. Khare and S.S. Srivastava Electricity and Magnetism Atma Ram and Sons, 10th edition, (1983). |
| 4 | D.R. Khanna and H.R. Gulati Optics, S. Chand and Co. Ltd., (1979). |
| 5 | V.K. Metha Principles of Electronics ,S. Chand and company, 6th edition, (2004). |

**Mapping with Programme Outcomes:**

| **CO/PO** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** |
|---|---|---|---|---|---|
| **CO1** | 2 | 3 | 3 | 2 | 2 |
| **CO2** | 3 | 2 | 2 | 3 | 2 |
| **CO3** | 3 | 3 | 3 | 2 | 2 |
| **CO4** | 3 | 2 | 3 | 3 | 2 |
| **CO5** | 2 | 2 | 2 | 3 | 2 |

**Strong-3 Medium-2 Low-1**

## Level of Correlation between PSO's and CO's

| CO/PO | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|---|---|---|---|---|---|
| **CO1** | 2 | 3 | 3 | 2 | 2 |
| **CO2** | 3 | 2 | 2 | 3 | 2 |
| **CO3** | 2 | 3 | 2 | 2 | 2 |
| **CO4** | 3 | 2 | 3 | 3 | 2 |
| **CO5** | 2 | 2 | 2 | 3 | 3 |

**Strong-3 Medium-2 Low-1**

**COURSE CONTENTS AND LECTURE SCHEDULE**

| Module No. | Topic | No. of Lectures |
|---|---|---|
| | **UNIT - I** | |
| 1.1 | Basic forces in nature –Types of forces – Gravitational force, Electromagnetic force and nuclear forces –Conservative and No conservative forces | 3 |
| 1.2 | Laws of Friction – Limiting, Coefficient and Angle of friction | 3 |
| 1.3 | Motion of bodies along an inclined plane – Work – Work done b varying force | 3 |
| 1.4 | Expression for kinetic energy and potential energy – Power | 3 |
| | **UNIT - II** | |
| 2.1 | Stress – Strain – Modulus of elasticity | 1 |
| 2.2 | Elastic constants – Bending of beam | 1 |
| 2.3 | Theory of uniform bending – Theory of non – Uniform bending – Determination of Young'smodulus by uniform and non – uniforr bending | 1 |
| 2.4 | Energy stored in a stretched wire – Torsion of a wire | 2 |
| 2.5 | Determination of rigidity modulus by torsional pendulum | 2 |
| 2.6 | Streamline and turbulent motion – Critical velocity | 1 |
| 2.7 | Coefficient of viscosity – Derivation of Poiseuille's formula (analytical method)–Bernoulli's theorem proof – | 2 |
| 2.8 | Applications – Venturimeter – Pitot tube | 2 |
| | **UNIT – III** | |
| 3.1 | Simple harmonic motions – Progressive waves properties | 3 |
| 3.2 | Composition of two S.H.M. and beats stationary waves | 3 |
| 3.3 | Properties – Beats – Acoustics Requisites for good auditorium | 3 |
| 3.4 | Ultrasonic – Production, detection and application. | 3 |
| | **UNIT – IV** | |
| 4.1 | Conduction - Thermal conductivity – Lee's disc method for conductivity of Bad conductor | 3 |
| 4.2 | Analogy between heat flow and electric current – Wiedemann-Franz law | 2 |

| | | |
|---|---|---|
| 4.3 | Convection – Lapse rate – Convection in atmosphere | 3 |
| 4.4 | Radiation - Determination of Stefan's Constant by filament heating method | 2 |
| 4.5 | Solar constant measurement – Water flow Pyrheliometer – temperature of the Sun | 2 |
| **UNIT - V** | | |
| 5.1 | Electric charge – Electric field – Electric potential | 1 |
| 5.2 | Ohm's law - Potentiometer – Principle – Comparison of emf of two cells | 2 |
| 5.3 | Calibration of ammeter and voltmeter (low range) – Biot-Savart's law | 2 |
| 5.4 | Magnetic field due to a current carrying long conductor | 3 |
| 5.5 | Magnetic Field along the axisof the coil carrying current | 2 |
| 5.6 | Peak, average and RMS values of ac currentand voltage – Power. | 2 |
| **Total** | | **60** |

**Course Designer**
**Name: Dr. T. K. Thirumalaisamy**
Associate Professor of Physics

| Course Code | Course Title | Category | Hours | Credits | Marks | | |
|---|---|---|---|---|---|---|---|
| | | | | | CIAE | TEE | Total |
| **26UMAFN11** | **FOUNDATION COURSE IN MATHEMATICS** | **Foundation Course (SEC)(MCQ)** | **2** | **2** | **25** | **75** | **100** |

| **Course Objectives** | | |
|---|---|---|
| The course deals with to bridge the gap and facilitate transition from higher secondary to tertiary education improve the ability to face the competitive examinations and to instill confidence among stake holders and inculcate interest for Mathematics. | | |
| **UNIT** | **Contents** | **No. of Hours** |
| **I** | Sets - Cartesian product - Constants and Variables, intervals and neighborhoods - Relations and Functions. | 6 |
| **II** | Fundamental principle of counting - Permutations -Properties of Permutation – Permutations as Functions. | 6 |
| **III** | Combinations - Derivation of formulae and their connections - simple applications-combinations with repetitions- Mathematical Inductions. | 6 |
| **IV** | Binomial theorem-General term, middle term - problems based on these concepts- Finite Sequences and Finite series - Infinite Sequences and series. | 6 |
| **V** | Limits – continuity-problems based on these concepts. | 6 |
| | **Total** | **30** |

| **Course Outcomes** | | **Knowledge Level** |
|---|---|---|
| **CO** | **On completion of this course, students will** | |
| 1 | Acquire the knowledge in sets relations ,functions and solve the related problems. | K1,K2,K3,K4 |
| 2 | Apply the principle of counting and to solve the problems in Permutations | K1,K2,K3,K4 |
| 3 | Solve problems in combinations with repetitions and Mathematical Inductions. | K1,K2,K3,K4 |
| 4 | Understand the behavior of binomial theorem and sequences, series. | K1,K2,K3,K4 |
| 5 | Acquire knowledge in limits and continuity. | K1,K2,K3,K4 |
| **K1-Knowledge** | **K2-Understand** **K3-Apply** | **K4-Analyze** |
| **Text Books** | | |
| 1. | State Board Mathematics text books of class XI and XII | |
| **Reference Books** | | |
| 1. | NCERT class XI and XII text books. | |

**Mapping with Programme Outcomes:**

| CO /PO | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| **CO1** | 1 | 2 | 2 | 1 | 2 |
| **CO2** | 3 | 2 | 3 | 3 | 3 |
| **CO3** | 2 | 3 | 2 | 3 | 3 |
| **CO4** | 3 | 2 | 2 | 2 | 2 |
| **CO5** | 2 | 3 | 2 | 1 | 2 |

**Strong-3 Medium-2 Low-1**

**Level of Correlation between PSO's and CO's**

| CO /PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|---|---|---|---|---|
| **CO1** | 1 | 2 | 2 | 1 | 2 |
| **CO2** | 3 | 2 | 3 | 3 | 3 |
| **CO3** | 2 | 3 | 2 | 3 | 3 |
| **CO4** | 3 | 2 | 2 | 2 | 2 |
| **CO5** | 2 | 3 | 2 | 1 | 2 |

**Strong-3 Medium-2 Low-1**

**COURSE CONTENTS AND LECTURE SCHEDULE**

| Module No. | Topic | No. of Lectures |
|---|---|---|
| | **UNIT - I** | |
| 1.1 | Sets - Cartesian product | 2 |
| 1.2 | Constants and Variables, intervals and neighbourhoods | 2 |
| 1.3 | Relations and Functions | 2 |
| | **UNIT - II** | |
| 2.1 | Fundamental principle of counting | 2 |
| 2.2 | Permutations - Properties of Permutation | 2 |
| 2.3 | Permutations as Functions | 2 |
| | **UNIT - III** | |
| 3.1 | Combinations - Derivation of formulae and their connections | 2 |
| 3.2 | Simple applications-combinations with repetitions | 2 |
| 3.2 | Mathematical Inductions | 2 |
| | **UNIT - IV** | |
| 4.1 | Binomial theorem | 2 |
| 4.2 | General term ,Middle term | 2 |
| 4.3 | Sequences and Series | 2 |
| | **UNIT - V** | |
| 5.1 | Limits | 2 |
| 5.2 | Continuity | 2 |
| 5.3 | Problems | 2 |
| | **Total** | **30** |

**Course Designer:**
**Name: Dr. P. Anitha**
Assistant Professor of Mathematics

| Course Code | Course Title | Category | Hours | Credits | Marks | | |
|---|---|---|---|---|---|---|---|
| | | | | | CIAE | TEE | Total |
| **26UMACC21** | **ANALYTICAL GEOMETRY** | **Core - III** | **5** | **5** | **25** | **75** | **100** |

**Course Objectives**

This course deals with fundamental concepts of Analytical Geometry in two and three dimensions. It emphasizes the use of coordinate geometric figures such as conics, planes, straight lines and spheres. It enable us to examine the theoretical knowledge of two and three dimensional structures.

| UNIT | Contents | No. of Hours |
|---|---|---|
| **I** | **General Equation of Ellipse:–** Equation of tangent to the ellipse – Pole and Polar with respect to ellipse – Conditions for the lines – The locus of the middle points of parallel chords of an ellipse – Conjugate diameters - Tangents at the extremities – Properties of conjugate diameters – Equi-conjugate diameters. | 15 |
| **II** | **Polar Equations:** Polar co-ordinates – Distance between the points – Transformation of polar co-ordinates into Cartesian co-ordinates – Area of a triangle – Equation of a straight line – Parallel straight lines – Perpendicular Straight lines – Equation of a circle – The chord joining the points on the circle – Polar equation of a conic - The equation of the chord and tangent of the conic – The asymptotes of the conic – Equation of the normal – Equation of the polar of any point with respect to the conic. | 15 |
| **III** | **The Planes:** General Equation - Intercept form - Normal form - Equation of planes passing through points - Angle between the planes - Length of perpendicular - Equation of planes that bisecting the angle between the planes. | 15 |
| **IV** | **The Straight line:** Symmetrical form - Equation of a Straight line passing through two points - The plane and the Straight line - Coplanar lines - shortest distance between two lines - Intersection of three planes. | 15 |
| **V** | **The Sphere:** Definition – Equation of the sphere – Length of the tangents – The plane section of a sphere is a circle – Intersection of two spheres is a circle - Equation of the tangent planes. | 15 |
| | **Total** | **75** |

| Course Outcomes | | Knowledge Level |
|---|---|---|
| **CO** | **On completion of this course, students will** | |
| 1 | Apply Equation of Ellipse and its properties to find tangents, normal, pole, polar and loci of points. | K1,K2,K3,K4 |

| | | |
|---|---|---|
| 2 | Use polar and Cartesian coordinates to solve problems on lines, circles, and conics, including tangents, normal, and asymptotes. | K1,K2,K3,K4 |
| 3 | Formulate and analyze equations of planes and compute angles, perpendicular distances, and bisecting planes. | K1,K2,K3,K4 |
| 4 | Determine equations of straight lines in 3D and solve problems on co planarity, shortest distance, and plane intersections. | K1,K2,K3,K4 |
| 5 | Demonstrate the sphere concepts and relate their properties Apply equations of spheres to solve problems on tangents, plane sections, intersections, and tangent planes. | K1,K2,K3,K4 |
| **K1-Knowledge** | **K2-Understand** | **K3-Apply** **K4-Analyze** |
| **Text Books** | | |
| 1. | Manikavachagam Pillay. T. K. and Natarajan. T, "***A Text Book of Analytical Geometry Part-I Two dimension"***, Viswanathan (Printers & Publishers) Pvt Ltd, Chennai,1997(Unit-I&II). | |
| 2. | Manikavachagam Pillay. T. K. and Natarajan. T, "***A Text Book of Analytical Geometry Part-II Three dimension"***, Viswanathan (Printers & Publishers) Pvt Ltd, Chennai,1997(Unit-III,IV and V). | |
| **Reference Books** | | |
| 1. | Dr. Arumugam. S and ISSAC, " ***Analytical Geometry of 3D and Vector Calculus***", New Gamma Publishing House, Palayankottai, October 2003. | |
| 2. | P. Duraipandian, "**Analytical Geometry of 2D**", Muhil publishers | |
| 3. | Shanthi Narayan and Dr.P.K.Mittal , "**Analytical Solid Geometry**", S Chand & amp Co Pvt. Ltd. | |
| **e-Resources** | | |
| 1. | https://nptel.ac.in | |

**Mapping with Programme Outcomes:**

| CO /PO | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 1 | 2 | 3 |
| **CO2** | 2 | 3 | 1 | 3 | 1 |
| **CO3** | 1 | 2 | 2 | 3 | 1 |
| **CO4** | 2 | 3 | 3 | 1 | 2 |
| **CO5** | 3 | 1 | 2 | 2 | 3 |

**Strong-3 Medium-2 Low-1**

**Level of Correlation between PSO's and CO's**

| CO /PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 2 | 3 | 1 |
| **CO2** | 2 | 3 | 1 | 2 | 2 |
| **CO3** | 1 | 3 | 2 | 2 | 3 |
| **CO4** | 3 | 1 | 2 | 3 | 1 |
| **CO5** | 1 | 3 | 2 | 1 | 3 |

**Strong-3 Medium-2 Low-1**

**COURSE CONTENTS AND LECTURE SCHEDULE**

| Module No. | Topic | No. of Lectures |
|---|---|---|
| | **UNIT - I** | |
| 1.1 | General Equation of Ellipse, Equation of tangent to the ellipse, Pole and Polar | 3 |
| 1.2 | The locus of the middle points of parallel chords of an ellipse | 4 |
| 1.3 | Conjugate diameters | 4 |
| 1.4 | Equi-conjugate diameters | 4 |
| | **UNIT - II** | |
| 2.1 | Polar co-ordinates | 3 |
| 2.2 | Equation of a straight line | 4 |
| 2.3 | Equation of a circle | 4 |
| 2.4 | The equation of the chord, tangent and polar of the conic | 4 |
| | **UNIT - III** | |
| 3.1 | General Equation of planes | 4 |
| 3.2 | Angle between the planes | 4 |
| 3.3 | Length of perpendicular | 4 |
| 3.4 | Equation of planes that bisecting the angle between the planes | 3 |
| | **UNIT - IV** | |
| 4.1 | Equation of a Straight line | 4 |
| 4.2 | The plane and the Straight line | 4 |
| 4.3 | Coplanar lines and shortest distance | 5 |
| 4.4 | Intersection of three planes | 2 |
| | **UNIT - V** | |
| 5.1 | Equation of the sphere | 3 |
| 5.2 | The plane section of a sphere is a circle | 4 |
| 5.3 | Intersection of two spheres is a circle | 4 |
| 5.4 | Equation of the tangent planes | 4 |
| | **Total** | **75** |

**Course Designer:**
**Name: N. Rayshima**
Assistant Professor of Mathematics

| Course Code | Course Title | Category | Hours | Credits | Marks | | |
|---|---|---|---|---|---|---|---|
| | | | | | CIAE | TEE | Total |
| **26UMACC2P** | **CALCULUS USING MAXIMA LAB** | **Core – IV (Lab)** | **3** | **3** | **40** | **60** | **100** |

| **Course Objectives** | | |
|---|---|---|
| This course is designed for those students who wish to learn numerous advance operations and functions in maxima software. | | |
| **UNIT** | **Contents** | **No. of Hours** |
| **I** | • Learn to use basic operators and functions in Maxima software.<br>• Simplify algebraic expressions and expressions containing radicals, logarithms, exponentials and trigonometric functions. | 9 |
| **II** | • Expand algebraic, rational, trigonometric and logarithmic expressions.<br>• Find derivatives of algebraic, trigonometric, exponential and logarithmic functions. | 9 |
| **III** | • Find derivatives of functions involving above mentioned functions.<br>• Problems of successive differentiation | 9 |
| **IV** | • Find indefinite integrals of different functions.<br>• Find definite integrals of different functions. | 9 |
| **V** | • To plot curves involving Cartesian, parametric and polar forms.<br>• To demonstrate singular points. | 9 |
| | **Total** | **45** |

| **Course Outcomes** | | **Knowledge Level** |
|---|---|---|
| **CO** | **On completion of this course, students will** | |
| 1 | Understand and apply concepts of limit, continuity, and Differentiability using maxima | K1,K2,K3,K4 |
| 2 | Understand asymptotes and curvature, their geometrical meanings, and solve related problems using maxima | K1,K2,K3,K4 |
| 3 | Identify and classify singular points of curves, understand curve rectification, and derive reduction formulae using maxima | K1,K2,K3,K4 |
| 4 | Evaluate areas bounded by curves, using maxima | K1,K2,K3,K4 |
| 5 | Maxima determine the volume and surface area of solids formed by the revolution of curves using maxima | K1,K2,K3,K4 |
| **K1-Knowledge** | **K2-Understand** **K3-Apply** | **K4-Analyze** |

| **Text Books** | |
|---|---|
| 1. | Zachary Hannan ,Solaono Community College .,"**wx Maxima for Calculus 1** " |
| **Reference Books** | |

| | |
|---|---|
| 1. | George B. Thomas Jr., Joel Hass, Christopher Heil & Maurice D. Weir (2018). ***Thomas' Calculus*** (14th edition). Pearson Education. |
| 2. | Differential and Integral Calculus : Shanti Narayan |
| **e-Resources** | |
| 1. | https://nptel.ac.in |

**Mapping with Programme Outcomes:**

| CO /PO | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 1 | 3 | 3 |
| **CO2** | 3 | 3 | 1 | 3 | 3 |
| **CO3** | 3 | 3 | 2 | 3 | 3 |
| **CO4** | 3 | 3 | 2 | 3 | 3 |
| **CO5** | 3 | 3 | 2 | 3 | 3 |

**Strong-3 Medium-2 Low-1**

**Level of Correlation between PSO's and CO's**

| CO /PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 1 | 3 | 3 |
| **CO2** | 3 | 3 | 1 | 3 | 3 |
| **CO3** | 3 | 3 | 2 | 3 | 3 |
| **CO4** | 3 | 3 | 2 | 3 | 3 |
| **CO5** | 3 | 3 | 2 | 3 | 3 |

**Strong-3 Medium-2 Low-1**

**COURSE CONTENTS AND LAB SCHEDULE**

| Module No. | Topic | No. of Hours |
|---|---|---|
| **UNIT - I** | | |
| 1.1 | Learn to use basic operators and functions in Maxima software. | 3 |
| 1.2 | Simplify algebraic expressions and expressions containing radicals. | 2 |
| 1.3 | Logarithms, exponentials. | 2 |
| 1.4 | Trigonometric functions. | 2 |
| **UNIT - II** | | |
| 2.1 | Expand algebraic, rational, trigonometric. | 2 |
| 2.2 | and logarithmic expressions. | 2 |
| 2.3 | Find derivatives of algebraic, trigonometric. | 2 |
| 2.4 | exponential and logarithmic functions. | 3 |
| **UNIT - III** | | |
| 3.1 | Identify and classify singular points of curves. | 3 |
| 3.2 | Understand curve rectification, derive reduction formulae using maxima. | 3 |
| 3.3 | derive reduction formulae using maxima. | 3 |

| | | |
|---|---|---|
| **UNIT - IV** | | |
| 4.1 | indefinite integrals of different functions. | 5 |
| 4.2 | Find definite integrals of different functions. | 4 |
| **UNIT - V** | | |
| 5.1 | To plot curves involving Cartesian parametric and polar forms. | 5 |
| 5.2 | To demonstrate singular points. | 4 |
| **Total** | | **45** |

**Course Designer:**
**Name: Dr. S. Mohamed Basheer**
Assistant Professor of Mathematics

| Course Code | Course Title | Category | Hours | Credits | Marks | | |
|---|---|---|---|---|---|---|---|
| | | | | | CIAE | TEE | Total |
| **26UMACC22** | **VECTOR CALCULUS AND APPLICATIONS** | **Core - V** | **4** | **4** | **25** | **75** | **100** |

**Course Objectives**

This course is designed to acquire Knowledge about differentiation of vectors and on differential operators. Knowledge about derivatives of vector functions and to develop skills in evaluating line, surface and volume integrals.

| UNIT | Contents | No. of Hours |
|---|---|---|
| **I** | Vector functions –Limit of a vector function - Derivative of a vector function-Partial Derivative of a vector function-Velocity of a Particle-Examples- Scalar and Vector point function –Level Surfaces-Directional derivative of a Scalar point function | 12 |
| **II** | The gradient of a scalar point function – Summation notation for gradient – Gradient of f(r)- Divergence and Curl of a vector - solenoidal and irrotational- simple applications. | 12 |
| **III** | Laplacian Differential Operator-Divergence and Curl of a Gradient-Divergence and Curl of a Curl – Vector identities - Line integral – Independence of path of integration- Simple problems. | 12 |
| **IV** | Surface integral - Volume integral – Applications- simple problems. | 12 |
| **V** | Gauss divergence Theorem- Green's Theorem - Stoke's Theorem – Simple problems. | 12 |
| | **Total** | **60** |

| Course Outcomes | | Knowledge Level |
|---|---|---|
| **CO** | **On completion of this course, students will** | |
| 1 | Find the derivative of vector and sum of vectors, product of Scalar and vector point function and to Determine derivatives of scalar and vector products. | K1,K2,K3,K4 |
| 2 | Applications of the operator 'del' and to explain solenoidal and irrotational vectors. | K1,K2,K3,K4 |
| 3 | Acquire knowledge in Laplacian Differential Operator and Solve simple line integrals. | K1,K2,K3,K4 |
| 4 | Solve surface integrals and volume integrals. | K1,K2,K3,K4 |
| 5 | Verify the theorems of Gauss, Stoke's and Green's (Two Dimension) | K1,K2,K3,K4 |

**K1-Knowledge K2-Understand K3-Apply K4-Analyze**

**Text Books**

1. P.Duraipandian and Kayalal Pachaiyappa, ***Vector Analysis***, S.Chand Publication, 2018.

**Reference Books**

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

**e-Resources**

1. https://nptel.ac.in

## Mapping with Programme Outcomes:

| CO /PO | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | 3 | 2 | 3 | 1 | 1 |
| CO2 | 3 | 2 | 3 | 1 | 2 |
| CO3 | 3 | 3 | 3 | 3 | 1 |
| CO4 | 3 | 3 | 3 | 3 | 1 |
| CO5 | 3 | 3 | 3 | 3 | 2 |

**Strong-3 Medium-2 Low-1**

## Level of Correlation between PSO's and CO's

| CO /PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|---|---|---|---|---|
| CO1 | 3 | 2 | 2 | 2 | 2 |
| CO2 | 3 | 2 | 1 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 2 | 1 |
| CO4 | 3 | 3 | 2 | 2 | 3 |
| CO5 | 3 | 3 | 1 | 2 | 2 |

**Strong-3 Medium-2 Low-1**

## COURSE CONTENTS AND LECTURE SCHEDULE

| Module No. | Topic | No. of Lectures |
|---|---|---|
| | **UNIT - I** | |
| 1.1 | Vector functions –Limit of a vector function -Velocity of a Particle-Examples. | 3 |
| 1.2 | Derivative of a vector function-Partial Derivative of a vector function. | 3 |
| 1.3 | Level Surfaces- Directional derivative of a Scalar point function. | 3 |
| 1.4 | Problems. | 3 |
| | **UNIT - II** | |
| 2.1 | The gradient of a scalar point function – Summation notation for gradient. | 3 |
| 2.2 | Gradient of f(r)- Divergence and Curl of a vector. | 3 |
| 2.3 | solenoidal and irrotational- simple applications. | 3 |
| 2.4 | Problems. | 3 |
| | **UNIT - III** | |
| 3.1 | Laplacian Differential Operator. | 3 |
| 3.2 | Divergence and Curl of a Gradient. | 3 |
| 3.3 | Divergence and Curl of a Curl – Vector identities. | 2 |
| 3.4 | Line integral –Independence of path of integration. | 2 |
| 3.5 | Simple problems. | 2 |

| | | |
|---|---|---|
| **UNIT - IV** | | |
| 4.1 | Surface integral. | 4 |
| 4.2 | Volume integral. | 4 |
| 4.3 | Applications- Simple problems. | 4 |
| **UNIT - V** | | |
| 5.1 | Gauss divergence Theorem. | 3 |
| 5.2 | Green's Theorem. | 3 |
| 5.3 | Stoke's Theorem. | 3 |
| 5.4 | Simple problems. | 3 |
| **Total** | | **60** |

**Course Designer:**
**Name: Dr. P. Anitha**
Assistant Professor of Mathematics

| Course Code | Course Title | Category | Hours | Credits | Marks | | |
|---|---|---|---|---|---|---|---|
| | | | | | CIAE | TEE | Total |
| **26UPHGE21** | **ALLIED PHYSICS – II** | **Generic Elective – III** | **4** | **3** | **25** | **75** | **100** |

| **Course Objectives** | | |
|---|---|---|
| To understand the basic concepts of Optics, Thermal physics, Semiconductor physics, and Electronics. | | |
| **UNIT** | **Contents** | **No. of Hours** |
| **I** | **GEOMETRICAL OPTICS**<br>Deviation produced by thin lens – focal length of two thin lenses in and out of contact – refraction through a thin prism – dispersion-dispersive power – Combination of thin prisms to produce i) deviation without dispersion and ii) dispersion without deviation – direct vision spectroscope - chromatic aberration in lenses and its removal – spherical aberration and its removal. | 12 |
| **II** | **INTERFERENCE AND DIFFRACTION**<br>Interference in thin films – air wedge - Newton's rings – determination of wavelength – Jamin's Interferometer-principle and uses - diffraction – theory of plane transmission grating (normal incidence only) – experiment to determine wave length. | 12 |
| **III** | **POLARISATION AND FIBER OPTICS**<br>Polarization - double refraction – nicol prism, constructions, action and uses – QWP and HWP – Optical activity – Biot's laws-Specific rotatory power – half shade polarimeter – determination of specific rotatory power – fiber optics – light propagation in fibers –fiber optic communication system. | 12 |
| **IV** | **SEMICONDUCTOR PHYSICS:**<br>Classification of materials – semiconductor – intrinsic and extrinsic semiconductor – junction diodes – forward and reverse bias – V-I characteristics of diode – Zener diode – V-I characteristics of Zener diode - LED – bridge rectifier using diode – π filter – transistor – V-I characteristics (CE mode only) | 12 |
| **V** | **DIGITAL ELECTRONICS:**<br>Binary number system – Binary to decimal and decimal to binary conversions - addition and subtraction of binary numbers – postulates of Boolean algebra – De Morgan's theorem – logic gates – OR, AND, NOT, NOR and NAND gates (I.C's only) – NOR and NAND gates as universal building blocks - XOR gates. | 12 |
| **Total** | | **60** |

| **Course Outcomes** | | **Knowledge Level** |
|---|---|---|
| **CO** | **On completion of this course, students will** | |

| | | |
|---|---|---|
| 1 | Know the different types of lenses, principal points, cardinal points and the equivalent focal length of the lens system. | K1,K2,K3 |
| 2 | Learn the principles of Interference, Diffraction and polarization and the experiments related to them. | K1,K2,K3 |
| 3 | Understand the concept of optical rotation. | K1,K2,K3 |
| 4 | Summarize the working of semiconductor devices like junction diode, Zener diode, transistors its characteristics and practical devices. | K1,K2,K3,K4 |
| 5 | Understand the fundamentals of digital electronics, binary number systems, conversions, and arithmetic operations, and apply Boolean algebra with basic logic gates to explain universal building blocks. | K1,K2,K3,K4 |
| **K1-Knowledge, K2-Understand, K3-Apply, K4- Analyze** | | |
| **Textbooks** | | |
| 1. | R. Murugesan, ***Optics and Spectroscopy***, Vivekanda Press, (2004) | |
| 2. | R. Murugesan, ***Thermal Physics***, SPM offset Printers. | |
| 3. | R. Murugeshan, ***Allied Physics*** – III$^{rd}$ semester, S. Chand and Co, (2001). | |
| **Reference Books** | | |
| 1. | Resnick Halliday and Walker ,***Fundamentals of Physics***,John Willey and Sons, Asia Pvt. Ltd., 11$^{th}$ edition, (2018). | |
| 2. | D. R. Khanna and H.R. Gulati, ***Optics***, S. Chand and Co. Ltd.,(1979). | |
| 3. | Beiser, ***Concepts of Modern Physics,*** Tata Mc Graw Hill Publication,(1997). | |
| 4. | Thomas L. Floyd, ***Digital Fundamentals***,Universal Book Stall, 11$^{th}$ edition, (2017). | |
| 5. | V.K. Metha, ***Principles of electronics***, S. Chand and Company, 6$^{th}$ edition,(2004). | |
| 6. | Brijlal and N. Subramaniyam ,***Heat and Thermodynamics*** – S.Chand & Co. | |
| 7. | A. Ubald Raj & Jose Robin ,***Ancillary Physics Vol-II***. | |

**Mapping with Programme Outcomes:**

| **CO /PO** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** |
|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 3 | 3 | 3 |
| **CO2** | 2 | 3 | 3 | 3 | 2 |
| **CO3** | 2 | 3 | 3 | 3 | 3 |
| **CO4** | 3 | 3 | 3 | 3 | 3 |
| **CO5** | 2 | 3 | 3 | 3 | 3 |

**Strong-3 Medium-2 Low-1**

## Level of Correlation between PSO's and CO's

| CO /PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 3 | 3 | 3 |
| **CO2** | 3 | 3 | 3 | 3 | 2 |
| **CO3** | 2 | 3 | 3 | 3 | 3 |
| **CO4** | 3 | 3 | 2 | 3 | 3 |
| **CO5** | 3 | 3 | 3 | 3 | 3 |

**Strong-3 Medium-2 Low-1**

**COURSE CONTENTS AND LECTURE SCHEDULE**

| Module No. | Topic | No. of Lectures |
|---|---|---|
| | **UNIT - I** | |
| 1.1 | Deviation produced by thin lens – Focal length of two thin lenses in and out of contact | 3 |
| 1.2 | Refraction through a thin prism – Dispersion-Dispersive power | 3 |
| 1.3 | Combination of thin prisms to produce i) Deviation without dispersion and ii) Dispersion without deviation – Direct vision spectroscope | 2 |
| 1.4 | Chromatic aberration in lenses and its removal | 2 |
| 1.5 | Spherical aberration and its removal. | 2 |
| | **UNIT - II** | |
| 2.1 | Interference in thin films – Air wedge - Newton's rings | 3 |
| 2.2 | Determination of wavelength – Jamin's Interferometer-principle and uses | 3 |
| 2.3 | Diffraction – Theory of plane transmission grating (normal incidence only) | 3 |
| 2.4 | Experiment to determine wave length. | 3 |
| | **UNIT - III** | |
| 3.1 | Double refraction – Nicol prisms, constructions, action and uses – QWP and HWP | 3 |
| 3.2 | Optical activity – Biot's laws-Specific rotator power – Half shade polarimeter | 3 |
| 3.3 | Determination of specific rotator power – Fiber optics | 3 |
| 3.4 | Light propagation in fibers –Fiber optic communication system. | 3 |
| | **UNIT - IV** | |
| 4.1 | Classification of materials – Semiconductor – Intrinsic and Extrinsic semiconductor | 3 |
| 4.2 | Junction diodes – Forward and Reverse bias – V-I characteristics of diode – Zener diode – V-I characteristics of Zener diode | 3 |
| 4.3 | LED – Bridge rectifier using diode – π filter | 3 |
| 4.4 | Transistor – V-I characteristics ( CE mode only ) | 3 |

| UNIT - V | | |
|---|---|---|
| 5.1 | Binary number system – Binary to decimal and decimal to binary conversions | 3 |
| 5.2 | Addition and Subtraction of binary numbers – Boolean algebra | 3 |
| 5.3 | De Morgan's theorem – Logic gates – OR, AND, NOT and NAND gates (I.C's only) | 3 |
| 5.4 | NOR and NAND gates as universal building blocks - XOR gates | 3 |
| **Total** | | **60** |

**Course Designer**
**Name: Dr. T. K. Thirumalaisamy**
Associate Professor of Physics

| Course Code | Course Title | Category | Hours | Credits | Marks | | |
|---|---|---|---|---|---|---|---|
| | | | | | CIAE | TEE | Total |
| **26UPHGE2P** | **ALLIED PHYSICS PRACTICAL** | **Generic Elective – II(Lab)** | **2** | **2** | **40** | **60** | **100** |

| **Course Objectives** | | |
|---|---|---|
| Apply various physics concepts to understand Properties of Matterand waves, set up experimentation to verify theories, quantify and analyses, able to do error analysis and correlate results | | |
| **Unit** | **Contents** | **No. of Hours** |
| **Minimum of Eight Experiments from the list** | | |
| I. | 1. Compound Pendulum-Determination of acceleration due to gravity<br>2. Compound Pendulum-Determination of acceleration due to gravity<br>3. Torsional Pendulum-Determination of Rigidity Modulus of the wire<br>4. Torsional Pendulum-Determination of Rigidity Modulus of the wire | 12 |
| II | 5. Uniform bending – Young's Modulus – Pin and Microscope<br>6. Ballistic Galvanometer - Comparison of Capacitances<br>7. Spectrometer – Determination of the refractive index of the prism | 12 |
| III | 8. Stokes Method – Coefficient of Viscosity<br>9. Sonometer -Verification of Laws<br>10. Air Wedge – Thickness of wire | 12 |
| IV | 11. Spectrometer – Determination of Dispersive power of a Prism<br>12. LCR Series resonance – Determination of self-inductance<br>13. Bridge rectifier – π filter | 12 |
| V | 14. Logic gates – AND, OR, NOT using IC's<br>15. Logic gates – NAND, NOR - using IC's<br>16. Owen's bridge (AC) – Comparison of capacitances | 12 |
| **Total** | | **60** |

| **Course Outcomes** | | **Knowledge Level** |
|---|---|---|
| **CO** | **On completion of this course, students will** | |
| 1 | Determine the properties of matter like rigidity modulus and to understand the elastic property. | K1,K2,K3 |
| 2 | Determine the properties of matter like young's modulus and to understand the elastic property. | K1,K2,K3 |
| 3 | Determine the Thickness of wire - Air Wedge | K1,K2,K3 |
| 4 | Determine the self-inductance by LCR Series resonance | K1,K2,K3,K4 |
| 5 | Understand the AND, OR, NOT by Logic gates | K1,K2,K3,K4 |
| **K1-Knowledge, K2-Understand, K3-Apply, K4- Analyze** | | |
| **Textbooks** | | |

| | |
|---|---|
| 1. | C.L. Arora, 2010, B.Sc. ***Practical Physics***, S. Chand and Co. |
| 2. | Brijlal and N. Subrahmanyam, 2003, **Properties of Matter**, S. Chand and Co. |
| **Reference Books** | |
| 1. | Brijlal and N. Subrahmanyam, 2003, **Properties of Matter**, S. Chand and Co. |

## Mapping with Programme Outcomes:

| CO /PO | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 3 | 3 | 2 |
| **CO2** | 3 | 3 | 3 | 2 | 3 |
| **CO3** | 3 | 2 | 3 | 3 | 3 |
| **CO4** | 2 | 3 | 3 | 3 | 3 |
| **CO5** | 3 | 3 | 2 | 3 | 3 |

**Strong-3 Medium-2 Low-1**

## Level of Correlation between PSO's and CO's

| CO /PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 2 | 3 | 3 |
| **CO2** | 3 | 3 | 3 | 3 | 3 |
| **CO3** | 3 | 3 | 3 | 2 | 3 |
| **CO4** | 2 | 3 | 3 | 3 | 3 |
| **CO5** | 3 | 3 | 3 | 3 | 2 |

**Strong-3 Medium-2 Low-1**

## COURSE CONTENTS AND LAB SCHEDULE

| Module No. | Topic | No. of Hours |
|---|---|---|
| **UNIT - I** | | |
| 1.1 | Compound Pendulum-Determination of acceleration due to gravity | 3 |
| 1.2 | Compound Pendulum-Determination of acceleration due to gravity | 3 |
| 1.3 | Torsional Pendulum-Determination of Rigidity Modulus of the wire | 3 |
| 1.4 | Torsional Pendulum-Determination of Rigidity Modulus of the wire | 3 |
| **UNIT – II** | | |
| 2.1 | Uniform bending – Young's Modulus – Pin and Microscope | 4 |
| 2.2 | Ballistic Galvanometer - Comparison of Capacitances | 4 |
| 2.2 | Spectrometer – Determination of the refractive index of the prism | 4 |
| **UNIT – III** | | |
| 3.1 | Stokes Method – Coefficient of Viscosity | 4 |
| 3.2 | Sonometer -Verification of Laws | 4 |

| | | |
|---|---|---|
| 3.3 | Air Wedge – Thickness of wire | 4 |
| **UNIT – IV** | | |
| 4.1 | Spectrometer – Determination of Dispersive power of a Prism | 4 |
| 4.2 | LCR Series resonance – Determination of self-inductance | 4 |
| 4.3 | Bridge rectifier – π filter | 4 |
| **UNIT – V** | | |
| 5.1 | Logic gates – AND, OR, NOT using IC's | 4 |
| 5.2 | Logic gates – NAND, NOR - using IC's | 4 |
| 5.3 | Owen's bridge (AC) – Comparison of capacitances | 4 |
| **Total** | | **60** |

**Course Designer**
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