

# **DEPARTMENT OF MATHEMATICS**

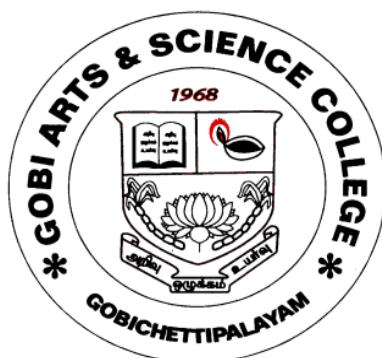
## **B.Sc. MATHEMATICS**

**(Students admitted during 2020-2021 Onwards)**

**(Under CBCS with Outcome Based Education (OBE) Pattern)**

### **SYLLABUS**

**I & II SEMESTER**



## **GOBI ARTS & SCIENCE COLLEGE**

(Govt. Aided Autonomous Co-educational Institution, Affiliated to  
Bharathiar University, Coimbatore, Accredited with 'A' Grade by NAAC (4<sup>th</sup> cycle)  
and Recognised as a STAR College by DBT, Government of India)

**KARATTADIPALAYAM POST,  
GOBICHETTIPALAYAM - 638453  
ERODE DISTRICT.**

## **GOBI ARTS & SCIENCE COLLEGE (Autonomous)**

### **Vision**

Social and Economic upliftment of the people of this area through value based quality Education.

### **Mission**

Committed to serve the society with humility and trust, devoid of exploitation; to impart value based higher education, particularly to the socially and economically deprived sections of this area; to make students of this institution worthy citizens of our glorious motherland.

## **DEPARTMENT OF MATHEMATICS**

### **Vision**

To strengthen the mental calculations, approximations, predictions, estimation of results and Mathematical problems to meet the challenge open to them.

### **Mission**

- To Achieve innovation in teaching, learning and research to realize goals of higher education.
- To improve the perspective of students on mathematics as per modern requirements.
- To empower the learners in achieving their professional goals related to mathematics through invited talks and workshops.

**GOBI ARTS & SCIENCE COLLEGE (AUTONOMOUS) : GOBICHETTIPALAYAM**

**SCHEME OF EXAMINATIONS - B.Sc. (MATHEMATICS) (20 BATCH)**

No.	Course Code	Part	Course	Total Hours	Hrs/Exam	Maximum Marks		Total Marks	Credits
						CIA	EOS		
<b>SEMESTER - I</b>									
1	20U1TM01	I	TAMIL - I	90	3	30	70	100	3.0
2	19U2EN01	II	ENGLISH - I	90	3	30	70	100	3.0
3	19UAMA01	III	MAJOR CORE : CALCULUS	75	3	30	70	100	4.0
4	19UAMA02	III	CLASSICAL ALGEBRA	60	3	30	70	100	3.5
5	19UBPH01	III	ALLIED CORE : PHYSICS - I	90	3	30	70	100	4.0
6	19U4HE01	IV	i) HUMAN EXCELLENCE PAPER - I : BASICS OF YOGIC LIFE	15	3	30	70	100	1.0
<b>SEMESTER - II</b>									
7	20U1TM02	I	TAMIL - II	90	3	30	70	100	3.0
8	19U2EN02	II	ENGLISH - II	90	3	30	70	100	3.0
9	19UAMA03	III	MAJOR CORE: DIFFERENTIAL EQUATIONS AND LAPLACE TRANSFORMS	75	3	30	70	100	3.5
10	20UAMA04	III	TRIGONOMETRY, VECTOR CALCULUS AND FOURIER TRANSFORMS	60	3	30	70	100	4.0
11	19UBPH02	III	ALLIED CORE : PHYSICS - II	90	3	30	70	100	4.0
12	19UBPHP1	III	ALLIED CORE : PHYSICS PRACTICAL	90	3	30	70	100	2.0
13	19U4HE02	IV	i) HUMAN EXCELLENCE PAPER - II : SUBLIMATION AND SOCIAL WELFARE	15	3	30	70	100	1.0
14	19U4HEP1	IV	PRACTICAL - I : YOGA PRACTICAL - I	15		100		100	1.0
15	19U4FN01	IV	ii) FOUNDATION SUBJECT - A : GENERAL AWARENESS		1.5		100	100	1.0
<b>SEMESTER - III</b>									
16	19U1TM03	I	TAMIL - III	90	3	30	70	100	3.0
17	19U2EN03	II	ENGLISH - III	90	3	30	70	100	3.0
18	19UAMA05	III	MAJOR CORE : MECHANICS	60	3	30	70	100	4.0
19	19UAMA06	III	PROBABILITY AND STATISTICS	60	3	30	70	100	3.5
20	19UBCH01	III	ALLIED CORE : CHEMISTRY	90	3	30	70	100	3.0
21	19U4HE03	IV	i) HUMAN EXCELLENCE PAPER - III : VIRTUES OF LIFE	15	3	30	70	100	1.0
22		IV	ii) FOUNDATION SUBJECT - B		3		100	100	2.0

Contd..

<b>SEMESTER - IV</b>									
23	19U1TM04	I	TAMIL - IV	90	3	30	70	100	3.0
24	19U2EN04	II	ENGLISH - IV	90	3	30	70	100	3.0
25	19UAMA07	III	MAJOR CORE : ANALYTICAL GEOMETRY	75	3	30	70	100	4.0
26	19UAMA08	III	OPERATIONS RESEARCH	60	3	30	70	100	3.5
27		III	ALLIED OPTIONAL :	90	3	30	70	100	5.0
28	19UBCHP1	III	ALLIED CORE : CHEMISTRY PRACTICAL	90	3	30	70	100	2.0
29	19U4HE04	IV	i) HUMAN EXCELLENCE PAPER - IV : PERSONALITY DEVELOPMENT	15	3	30	70	100	1.0
30	19U4HEP2	IV	PRACTICAL - II : YOGA PRACTICAL - II	15		100		100	1.0
31		IV	ii) FOUNDATION SUBJECT - B		3		100	100	2.0
32		V	CO-CURRICULAR ACTIVITIES						1.0
<b>SEMESTER - V</b>									
33	19UAMA09	III	MAJOR CORE : REAL ANALYSIS - I	90	3	30	70	100	6.0
34	19UAMA10	III	COMPLEX ANALYSIS - I	90	3	30	70	100	6.0
35	19UAMA11	III	ABSTRACT ALGEBRA	90	3	30	70	100	6.0
36	19UAMA12	III	PROGRAMMING IN C	60	3	30	70	100	4.0
37	19UAMAP1	III	MAJOR CORE PRACTICAL : PROGRAMMING IN C	30	3	30	70	100	2.0
38		III	MAJOR OPTIONAL :	90	3	30	70	100	4.0
<b>SEMESTER - VI</b>									
39	19UAMA13	III	MAJOR CORE : REAL ANALYSIS - II	90	3	30	70	100	6.0
40	19UAMA14	III	COMPLEX ANALYSIS - II	90	3	30	70	100	6.0
41	19UAMA15	III	LINEAR ALGEBRA	90	3	30	70	100	6.0
42	19UAMA16	III	DISCRETE MATHEMATICAL STRUCTURES	90	3	30	70	100	6.0
43	19UEMA01	III	MAJOR SKILL BASED PAPER : NUMERICAL METHODS	60	3	30	70	100	4.0
44	19UEMAP1	III	MAJOR SKILL BASED PRACTICAL	30	3	30	70	100	2.0

**CREDITS:**

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**PART I : 12      PART II : 12      PART III : MAJOR : 88**  
**ALLIED: 20**  
**---->108**

**PART IV : 11      PART V : 1      TOTAL : 144**

## BLOOM'S TAXONOMY BASED ASSESSMENT PATTERN

K1-Remember; K2- Understanding; K3- Apply; K4-Analyze; K5- Evaluate

### I. END OF SEMESTER (EOS) EXAMINATIONS:

#### 1. Part I, II & III-Theory: 70 Marks

Knowledge Level	Section	Marks	Description	Total
K1	A (Answer All)	$15 \times 1 = 15$	MCQ	70
K2	B (Either or Pattern)	$5 \times 5 = 25$	Short answers	
K3 & K4	C (Answer 3 out of 5)	$3 \times 10 = 30$	Descriptive/Detailed	

#### 2. Practical Examinations: 70 Marks

Knowledge Level	Section		Total
	Practical	Record work	
K3	60	10	70
K4			
K5			

### II. CONTINUOUS INTERNAL ASSESSMENT (CIA):

#### 1. Test – I & II: 30 Marks (Theory)

Knowledge Level	Section	Marks	Description	Total
K1	A (Answer All)	$10 \times 1 = 10$	MCQ	30
K2	B (Answer 2 out of 3)	$2 \times 5 = 10$	Short answers	
K3 & K4	C (Answer 1 out of 2)	$1 \times 10 = 10$	Descriptive/Detailed	

#### 2. Practical Internal Assessment: 30 Marks

Knowledge Level	Section		Total
	Test	Lab Performance	
K3	20	10	30
K4			
K5			

#### Components of Continuous Internal Assessment (CIA)

Components		Calculation	CIA Total
Test 1	30	$\frac{\text{Test 1} + \text{Test 2}}{2}$	30
Test 2	30		

## **Programme Specific Objectives**

The students will be able to do, on successful completion of programme,

1. The aims of teaching and learning mathematics in to develop skills in problem solving, logical thinking, communication and presentation effectively.
2. Efforts are made to measure cognitive as well as applied learning and examination, project work, quiz, classroom assessments are the different components of measurements.
3. Curriculum and course upgradation are in periodic process it is basically to enhance the learning to provide latest knowledge.
4. By adopting good teaching methods the students can understanding the reality and the integral development of scheme.

## **Programme Specific Outcomes (PSO)**

**PSO1:** Constructive mathematical thinking based on the meaningful knowledge of the students.

**PSO2:** Interpret and generate information with mathematical concepts and statistics.

**PSO3:** Understand, formulate and use quantitative models arising in other disciplines.

**PSO4:** Interpret and represent mathematical expression, process & result with words, drawing, symbols and numbers.

**PSO5:** Communicate the results using progressive mathematical expression.

<b>Programme Code:</b>	B.Sc.	<b>Programme Title:</b>	Mathematics	
<b>Course Code:</b>	19UAMA01	<b>Course Title:</b>	<b>Batch:</b>	2019
<b>Total Hours:</b>	75	Calculus	<b>Semester:</b>	I
			<b>Credits:</b>	4.0

### Course Objective

#### The course aims

- To focus on conceptual understanding.
- To explore fundamental concepts of differential and integral calculus.
- To prepare students to succeed in upper level maths, science, engineering and other courses which require calculus.

### Course Outcomes (CO)

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

Knowledge Level	CO Number	Course Outcome
<b>K1, K2</b>	<b>CO1</b>	Compute tangent, subtangent, normal, subnormal and radius & centre of curvature in cartesian and polar co-ordinates.
<b>K2, K3</b>	<b>CO2</b>	Finding asymptotes of rational algebraic and polar curves. Also to study the singular points.
<b>K2</b>	<b>CO3</b>	Get the knowledge of definite integrals, Beta and Gamma functions.
<b>K3</b>	<b>CO4</b>	Evaluation of double and triple integrals.
<b>K2</b>	<b>CO5</b>	Expressing the given function as a trigonometric series using fourier series concept.

**K1** - Remember; **K2** - Understanding; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate

SYLLABUS		
Unit	Content	No. of Hours
<b>I</b>	Length of the tangent, normal, subtangent and subnormal in Cartesian and polar coordinates. Curvature and radius of curvature in Cartesian Co-ordinates & polar co-ordinates, implicit form and parametric form. The co-ordinates of centre of curvature. Equation of circle of curvature. Envelope, evolute and involute.	<b>15</b>
<b>II</b>	Asymptotes: Definition, Asymptotes of rational algebraic curve. Asymptotes parallel to co-ordinate axes. Asymptotes by inspection. Intersection of a curve and its asymptotes. Asymptotes of polar curves. Singular points: Concavity and convexity. Points of inflexion. Multiple points. Double points. <i>(Self study- Singular points)</i>	<b>15</b>
<b>III</b>	Integration: Reduction formulae. Definite integrals. Definitions of Beta and Gamma functions. Properties.	<b>15</b>
<b>IV</b>	Multiple integrals: Definitions of double and triple integrals. Evaluation of double integrals. Change the order in double integrals. Evaluation of triple integrals. Jacobians change of variables in double and triple integrals.	<b>15</b>

<b>V</b>	Fourier series: Definition. Determination of Fourier coefficients. Even and odd functions. Half range Fourier series.	<b>15</b>
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**Text Book:**

1. Calculus Vol-I, II, III by T.K.Manicavachagom pillay & S. Narayanan.

**Reference Books:**

1. Tom M.Apostol, "Calculus Vol-1 & Vol-2" published by John Wiley & Sons, United states-2016, 2nd edition.
2. James Stewart, "Calculus: Early Transcendentals" published by Thomson books/Cole, USA-2008, 6th edition.

**E-references:**

1. <http://nptel.ac.in/courses/111104085/29>
2. <https://www.khanacademy.org/math/calculus-home>
3. <https://ocw.mit.edu/courses/mathematics/18-01-single-variable-calculus-fall-2006/video-lectures/>
4. <http://www.math.odu.edu/~jhh/Volume-1.PDF>
5. <http://www.math.odu.edu/~jhh/Volume-2.PDF>

**Mapping with Programme Specific Outcomes**

<b>CO \ PSO</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>
<b>CO1</b>	H	M	S	H	M
<b>CO2</b>	S	M	H	M	M
<b>CO3</b>	M	H	S	H	S
<b>CO4</b>	H	M	S	H	H
<b>CO5</b>	H	S	H	M	H

S - Strong; H - High; M - Medium; L - Low

<b>Programme Code:</b>	B.Sc.	<b>Programme Title:</b>	Mathematics	
<b>Course Code:</b>	19UAMA02	<b>Course Title:</b>	<b>Batch:</b>	2019
<b>Total Hours:</b>	60	Classical Algebra	<b>Semester:</b>	I
			<b>Credits:</b>	3.5

### Course Objective

#### The course aims

- To acquire the basic concepts of Convergence and Divergency.
- To gain complete knowledge of Summation and approximation of a series and to understand the concepts of problem solving skills on Theory of Equations.
- To develop the knowledge in Theory of Numbers.

### Course Outcome

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

Knowledge Level	CO Number	Course Outcome
<b>K4</b>	<b>CO1</b>	Analyzing the infinite series is convergent or divergent by selecting appropriate tests.
<b>K1, K3</b>	<b>CO2</b>	Find the sum of finite and infinite series through Binomial, Exponential and Logarithmic Series.
<b>K1, K2, K3</b>	<b>CO3</b>	Find the roots of an equation by solving the equations using various techniques.
<b>K2, K3</b>	<b>CO4</b>	Find the approximate roots of an equation by Horner's and Newton's approximation.
<b>K2, K3</b>	<b>CO5</b>	Gain knowledge in Number theory, study the concept of congruences and its properties.

**K1** - Remember; **K2** - Understanding; **K3** - Apply; **K4** - Analyze; **K5** – Evaluate

### SYLLABUS

Unit	Content	No. of Hours
<b>I</b>	<b><u>Convergency and Divergency of Series:</u></b> Infinite series – Geometric series – Some general theorems concerning infinite series – The series is Convergent when $K$ is greater than unity and Divergent when $K$ equal to or less than unity – Cauchy's Condensation Test – D'Alembert's Ratio Test – Cauchy's Root Test – Raabe's Test – Absolute Convergence. (Chapter 2 : Sections 2.8 to 2.24, Vol-I)	<b>12</b>
<b>II</b>	<b><u>Binomial, Exponential and Logarithmic Series:</u></b> Binomial theorem for a rational index – Application of the Binomial Theorem to the summation of the Series – Approximate Values – Exponential limit – The Exponential Theorem – Summation – The Logarithmic Series – Euler's Constant – Summation – The application of the Exponential and Logarithmic series to limits approximations. (Chapter 3 : Sections 3.5, 3.6, 3.10 & 3.14, Vol - I) (Chapter 4 : Sections 4.1, 4.2, 4.3, 4.3.1, 4.5 to 4.11, Vol -I)	<b>12</b>
<b>III</b>	<b><u>Theory of Equations:</u></b> Roots of an equation – Relations between the roots co-efficients of equations– Symmetric functions of the roots – Transformation of equations – Reciprocal equations.	<b>12</b>

	(Chapter 6 : Sections 6.1 to 6.12, 6.15 & 6.16, Vol - I)	
<b>IV</b>	<p><b><u>Theory of Equations:</u></b>          To increase or Decrease the roots of a given equation by a given quantity – Removal of terms – Descartes’ rule of signs – Rolles’ Theorem – Multiple roots – Horner’s method and Newton’s Approximation.          (Chapter 6 : Sections 6.17 to 6.19, 6.24 to 6.26 &amp; 6.30, Vol -I)</p>	<b>12</b>
<b>V</b>	<p><b><u>Theory of Numbers:</u></b>          Prime and Composite numbers – divisors of a given number N – Euler’s function <math>\varphi(N)</math>– Integral part of real number – The highest power of a Prime p contained in n! – The product of r consecutive integers is divisible by r! – Congruences – Fermat’s Theorem – Wilson’s Theorem and Lagrange’s Theorem (statement and problems only)          (Chapter 5: Sections 5.1 to 5.18, Vol - II)  <i>Self study: Congruences.</i></p>	<b>12</b>

**Text Book:**

1. Algebra, Vol-I and Vol-II – Manicavachagom Pillay and Others (2014), Published by S.Viswanathan (Printers and Publishers) Pvt. Ltd, 38, McNichols road, Chetput, Chennai-600031.

**Reference Books:**

1. Algebra – Brahma Nand, B.S.Tyagi, Bhu Dev Sharma, Kedar Nath, Ram Nath Publishers, 6<sup>th</sup> Edition, 1972.
2. Classical Algebra – Sudhi.K.Pundir, CBS Publishers and Distributers Pvt. Ltd, 1<sup>st</sup> Edition, 2015.
3. Classical Algebra Problems and Solutions – Joydeep chakraborty, Academic Publishers, Kolkatta, 1<sup>st</sup> Edition, 2012.

**E-references:**

1. <http://www.jjernigan.com/172/ConvergenceDivergenceNotes.pdf>
2. <https://www.math.nyu.edu/faculty/hausner/congruence.pdf>
3. <http://sites.millersville.edu/bikenaga/number-theory/wilson-fermat.html>

**Mapping with Programme Specific Outcomes**

<b>CO \ PSO</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>
<b>CO1</b>	H	M	M	H	H
<b>CO2</b>	M	M	H	M	H
<b>CO3</b>	H	M	M	M	S
<b>CO4</b>	M	H	M	H	M
<b>CO5</b>	S	M	M	H	H

**S** - Strong; **H** - High; **M** - Medium; **L** – Low

<b>Programme Code:</b>	B.Sc.	<b>Programme Title</b>	Mathematics	
<b>Course Code:</b>	19UBPH01	<b>Course Title</b>	<b>Batch</b>	2019
<b>Total Hours:</b>	90	Allied Core Physics - I for Mathematics	<b>Semester</b>	I
			<b>Credits</b>	4.0

### Course Objective

#### The course aims

- To acquire basic knowledge of Elasticity, Viscosity, Sound, Wave mechanics and Relativity.
- To apply the Laws of Thermodynamics to the thermodynamical system.
- To understand the concepts of Electricity, Magnetism and Electronics.

### Course Outcomes (CO)

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

Knowledge Level	CO Number	Course Outcome
<b>K1, K2, K3, K4, K5</b>	<b>CO1</b>	Know the concepts of relativity, types of vibration and applications of ultrasonics.
	<b>CO2</b>	Understand the elastic properties of solids and the basic concepts of spectroscopy
	<b>CO3</b>	Gain knowledge about thermal physics, liquefaction of gases, laws of thermodynamics and heat transfer mechanism
	<b>CO4</b>	Enhance knowledge about electricity and growth, decay of current in LCR circuits

**K1** - Remember; **K2** - Understanding; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate

### SYLLABUS

Unit	Content	No. of Hours
<b>I</b>	<b>RELATIVITY:</b> Theory of relativity – Frames of reference – Galilean transformation equation – Ether hypothesis – Michelson Morley experiment – Postulates of special theory of relativity – The Lorentz transformation equations – Length contraction – Time dilation – Addition of velocities – Variation of mass with velocity – Mass energy equivalence. <b>SOUND: Types of vibration:</b> Undamped vibration, damped vibration, forced vibration, Resonance and sharpness of resonance – Doppler Effect – Derivation – Production of Ultrasonic waves – Piezo electric method – applications.	<b>18</b>
<b>II</b>	<b>ELASTICITY :</b> Work done in stretching a wire – Bending of beams – An expression for the bending moment – Depression at the free end of a cantilever – Experimental determination of young's modulus by Non-uniform bending method – Uniform bending method with necessary theory. Dynamics of Rigid bodies – Theory of compound Pendulum – Simple pendulum – Reversibility of Oscillator and suspension - Determination of g and Radius of gyration of a bar pendulum – Equivalent length – minimum Time period.	<b>18</b>
<b>III</b>	<b>THERMODYNAMICS: Concepts of Real Gases:</b> Definition of critical constants of a gas – Experimental determination of critical constants – Van der waals equation – critical constants interms of van der waal's constants – Demerits of van der waal's	<b>18</b>

	equation – Reduced equation of state. Joule – Kelvin porous plug experiment – Temperature of Inversion – Effects and Results of porous plug experiment – Theory of porous plug experiment – Relation between Boyle Temperature, Temperature of Inversion and critical temperature – Liquefaction of Helium – Properties of Liquid Helium.	
<b>IV</b>	<b>SECOND LAW OF THERMODYNAMICS:</b> Reversible and Irreversible processes – condition for Reversibility – Statements of second law – Carnot’s Reversible Engine – Cycle – Indication Diagram – Efficiency of Carnot’s Engine – Carnot’s Theorem and its proof. <b>THERMAL CONDUCTION:</b> Co-efficient of Thermal conductivity – Temperature gradient – Dimensional Formula – Thermal Diffusivity, Lee’s Disc method of determining the thermal conductivity of a bad conductor. <b>SPECTROSCOPY:</b> Types of Atomic and Molecular spectra – Theory of Rotational spectrum – Applications – Theory of Vibrational Rotational spectrum – Applications, Electronic band spectrum – Raman effect – Experimental set up to study Raman effect – Quantum theory of Raman effect – applications.	<b>18</b>
<b>V</b>	<b>ELECTRICITY: Chemical effect of electric current:</b> Electrical conductivity of an electrolyte – Determination of specific conductivity of an electrolyte – Kohlrausch bridge – Arrhenius theory of electrolytic dissociation. <b>Helmholtz equations of varying currents:</b> Growth and decay of current in a circuit containing a resistance and an inductance – charging and discharging a capacitor through a resistor – Measurement of high resistance by Leakage of charge – expressions for the average and RMS value of an alternating current – LCR series resonance circuit.	<b>18</b>

<\* Self Study: Radar, LCR parallel resonance circuit>

#### Text Books:

1. R.Muruugesan and Kiruthiga Sivaprasath, Modern Physics, 2018 edition, S Chand & Company Ltd., New Delhi.
2. R.Murugesan and Kiruthiga Sivaprasath, Properties of Matter, 2<sup>nd</sup> edition, Chand & Company Ltd., New Delhi.
3. Brijlal, N.Subrahmaniam and P.S.Hemne, Heat Thermodynamics and Statistical Physics, 2018 edition, S Chand & Company Ltd., New Delhi,
4. R.Muruugesan, Electricity and Magnetism, 2013 edition, S Chand & Company Ltd., New Delhi.

#### Reference Books:

1. Brijlal and Subramaniam, Properties of matter, 1997 edition, Chand & Company Ltd., New Delhi,
2. Heat & Thermodynamics - D.S.Mathur –Sultan chand & sons.
3. Brijlal and Subramaniam, A Text Book of Electricity and Magnetism, 2000 edition, Ratan Prakashan Mandir, Agra.

#### E- references:

1. <https://www.toppr.com/guides/physics/thermodynamics/carnot-engine/>
2. [https://physicscatalyst.com/wave/shm\\_2.php](https://physicscatalyst.com/wave/shm_2.php)
3. <https://www.elprocus.com/radar-basics-types-and-applications/>
4. <http://scienceworld.wolfram.com/physics/Michelson-MorleyExperiment.html>
5. [https://physicscatalyst.com/electromagnetism/AC\\_3.php](https://physicscatalyst.com/electromagnetism/AC_3.php)
6. <https://www.toppr.com/guides/chemistry/states-of-matter/liquefaction-of-gases/>
7. <https://study.com/academy/lesson/the-doppler-effect-definition-examples-applications.html>
8. <https://nptel.ac.in/downloads/115101003/>

### Mapping with Programme Specific Outcomes

<b>CO \ PSO</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>
<b>CO1</b>	S	H	S	H	S
<b>CO2</b>	S	S	S	S	H
<b>CO3</b>	S	H	S	H	S
<b>CO4</b>	S	H	S	H	S

**S** - Strong; **H** - High; **M** - Medium; **L** - Low

<b>Programme Code:</b>	B.Sc.	<b>Programme Title:</b>	Mathematics	
<b>Course Code:</b>	19UAMA03	<b>Course Title:</b>	<b>Batch:</b>	2019
<b>Total Hours:</b>	75	Differential Equations and Laplace Transforms	<b>Semester:</b>	II
			<b>Credits:</b>	3.5

### Course Objective

#### The course aims

- To introduce the basic concepts of Linear Differential Equations with constant and variable coefficients.
- To learn the concepts of ordinary and partial differential equations.
- To study the Laplace transforms.

### Course Outcomes (CO)

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

Knowledge Level	CO Number	Course Outcome
<b>K1, K2</b>	<b>CO1</b>	Solve the first order differential equations through various techniques.
<b>K2</b>	<b>CO2</b>	Learn the methods for solving Linear Differential Equations with constant and variable coefficients.
<b>K2</b>	<b>CO3</b>	Evaluate the partial differential equations of first order using different methods.
<b>K1, K2</b>	<b>CO4</b>	Understand the basic concepts of Laplace and Inverse Laplace Transforms.
<b>K3</b>	<b>CO5</b>	Apply Laplace and Inverse Laplace transforms to solve the ordinary differential equations.

**K1** - Remember; **K2** - Understanding; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate

### SYLLABUS

Unit	Content	No. of Hours
<b>I</b>	<p><b>Ordinary Differential Equations</b>            Equations of the first order, but of higher degree – Equations solvable for p - Equations solvable for y – Equations solvable for x – Clairant's form – Equations that do not contain x explicitly – Equations that do not contain y explicitly – Equations homogeneous in x and y.            Linear Differential Equations with constant coefficients – Evaluation of equations of the form <math>f(D)y = X</math>, where X is <math>e^{\alpha x}</math> or <math>\cos \alpha x</math>, <math>\sin \alpha x</math>, <math>x^m</math>, <math>e^{\alpha x} V</math>, where V is any function of x.  <b>Self-Study: Evaluation of equations of the form <math>f(D)y = X</math>, where X is <math>e^{\alpha x}</math>.</b></p>	<b>15</b>
<b>II</b>	Linear Differential Equations with variable coefficients – Equations reducible to the Linear homogeneous equation – Variation of parameters – Simultaneous Differential equations of the form	<b>15</b>

	<p>i. <math>\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}</math>,</p> <p>ii. <math>f_1(D)x + \Phi_1(D)y = T_1</math>,  <math>f_2(D)x + \Phi_2(D)y = T_2</math>.</p>	
<b>III</b>	<p><b><u>Partial Differential Equations</u></b>  Derivation of partial differential equations by eliminating arbitrary constants and functions – Different integrals of partial differential equations – Solutions of partial differential equations in some simple cases – Solutions of first order partial differential equations of the form</p> <p>i. <math>f(p, q) = 0</math>,</p> <p>ii. <math>f(x, p, q) = 0</math>, <math>f(y, p, q) = 0</math>, <math>f(z, p, q) = 0</math>,</p> <p>iii. <math>f_1(x, p) = f_2(y, q)</math>,</p> <p>iv. <math>z = px + qy + f(p, q)</math>.</p>	<b>15</b>
<b>IV</b>	<p><b><u>Laplace Transforms</u></b>  Definition of Laplace Transform – Properties of Laplace Transform – Some general theorems – Laplace Transform of Integrals – The inverse Laplace Transforms.</p>	<b>15</b>
<b>V</b>	<p>Solving second order ordinary differential equations with constant coefficients and simultaneous linear differential equations using Laplace transforms.  Solving the partial differential equation of the form <math>P_p + Q_q = R</math> (Lagrange's Equation)</p>	<b>15</b>

**Text Book:**

1. Calculus Vol – 3 by S. Narayanan & T.K. Manicavachagom Pillay, Viswanathan printers and publishers Pvt. Ltd., Chennai, Reprint 2018.

**Unit-1**

Chapter: 1 – sections 5-7  
Chapter: 2 – sections 1-4

**Unit-2**

Chapter: 2 – sections 8-10  
Chapter: 3 – sections 1-4, 6

**Unit-3**

Chapter: 4 – sections 1-5.4

**Unit-4**

Chapter: 5 – sections 1, 2, 4-6

**Unit-5**

Chapter: 5 – sections 8, 9  
Chapter: 4 – sections 6

- Question paper setters are asked to confine to the above **text books** only.

**Reference Books:**

1. Ordinary and partial differential equations by M.D. Resinghania, S. Chand & sons, New Delhi, 2016, 18<sup>th</sup> Edition.
2. Engineering Mathematics by Dr.M.K. Venkatraman, The National Publishing Company Frist edition 1998.

**E-references:**

1. <https://nptel.ac.in/courses/111105035/22>
2. <https://nptel.ac.in/courses/103103037/5>
3. [https://www.math.ust.hk/~machas/differential\\_equations.pdf](https://www.math.ust.hk/~machas/differential_equations.pdf).
4. [https://WWW.math.psu.edu/shen\\_w/PDE/Notes PDF.pdf](https://WWW.math.psu.edu/shen_w/PDE/Notes PDF.pdf)

**Mapping with Programme Specific Outcomes**

<b>CO \ PSO</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>
<b>CO1</b>	M	M	M	M	S
<b>CO2</b>	M	S	M	S	S
<b>CO3</b>	M	S	M	S	S
<b>CO4</b>	S	M	M	M	S
<b>CO5</b>	S	M	M	M	S

**S** - Strong; **H** - High; **M** - Medium; **L** - Low

<b>Programme Code:</b>	B.Sc.	<b>Programme Title:</b>	Mathematics	
<b>Course Code:</b>	20UAMA04	<b>Course Title:</b>	<b>Batch:</b>	2020
<b>Total Hours:</b>	60	Trigonometry, Vector Calculus and Fourier transforms	<b>Semester:</b>	II
			<b>Credits:</b>	4.0

### Course Objective

#### The course aims

- To focus on conceptual understanding.
- To prepare students to succeed in upper level math, science, engineering & other courses which required trigonometry & vector calculus.
- To impart the application of sine & cosine functions in signals using fourier transform.

### Course Outcome

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

Knowledge Level	CO Number	Course Outcome
<b>K2</b>	<b>CO1</b>	Able to handle with confidence in wide range of trigonometric identities.
<b>K1</b>	<b>CO2</b>	Find logarithmic of a complex number and summation of trigonometric series.
<b>K1</b>	<b>CO3</b>	Understand the relation between directional derivative, gradient, divergence & curl.
<b>K3</b>	<b>CO4</b>	Evaluate line, surface and volume integrals. Make use of theorems to study the relation between line, surface & Volume Integrals.
<b>K3</b>	<b>CO5</b>	Understand the definition of Fourier transforms and can apply the properties of the Fourier transforms.

**K1** - Remember; **K2** - Understanding; **K3** - Apply; **K4** - Analyze; **K5** – Evaluate

SYLLABUS		
Unit	Content	No. of Hours
<b>I</b>	<b>TRIGONOMETRY</b> Expansion of $\cos n\theta$ , $\sin n\theta$ , $\cos^n \theta$ , $\sin^n \theta$ , Hyperbolic functions: Separation of real & imaginary part of $\sin(\alpha + i\beta)$ , $\sinh(\alpha + i\beta)$ , $\tanh(\alpha + i\beta)$ , $\tan^{-1}(\alpha + i\beta)$ .	<b>12</b>
<b>II</b>	Inverse hyperbolic functions- Logarithm of complex numbers. Summation of trigonometric series.	<b>12</b>
<b>III</b>	<b>VECTOR CALCULUS</b> Scalar & Vector point functions - Differentiation of vector - Differential Operators - Directional derivatives - Gradient - Divergence & curl.	<b>12</b>
<b>IV</b>	Integration of vector: Line, Surface & Volume Integrals (Theorems of Gauss, Green, Stoke's - (statements only) Simple problems.	<b>12</b>
<b>V</b>	<b>FOURIER TRANSFORMS</b> Infinite F.T. - Properties of F.T - Shifting theorem - Convolution theorem - Infinite Fourier Cosine Transform - Sine transforms - Fourier transforms of derivative - Finite F.T - Finite Sine - Cosine Transforms - Inversion formula. (Self study-Finite F.T)	<b>12</b>

**Text Books:**

1. Trigonometry - by S.Narayanan & T.K.M.Pillai.
2. Vector Calculus - by P.Duraipandian & Laxmi Duraipandian.
3. Differential equations, Fourier & Laplace transforms - by P.R. Vital.

**Reference Books:**

1. Robert E Mayer, "Schaum's Outlines Trigonometry" Tata Mc GrawHill publishing company New Delhi - 2013, 5th edition.
2. M.D.Raisinghania, H.C.Saxena, H.K.Dass, "Trigonometry" S.Chand & sons publishing company New Delhi - 2002.
3. James Stewart, "Calculus: Early Transcendentals" Thomson Books/Cole, USA - 2008, 6<sup>th</sup> edition.
4. Peter V.O'Neil, "Advanced Engineering Mathematics" Cengage Learning India Pvt. Ltd. New Delhi - 2012, 7th edition.

**E-references:**

1. <http://nptel.ac.in/courses/122101003/downloads/Lecture-44.pdf>
2. <https://www.khanacademy.org/math/multivariable-calculus/integrating-multivariable-functions/line-integrals-vectors/v/line-integrals-and-vector-fields>
3. <https://www.pdfdrive.net/calculus-early-transcendentals-8th-ed-2015pdf-e27097109.html>  
Search -> (<https://www.pdfdrive.net/>) -> (Academic and Engineering) -> (Engineering)

**Mapping with Programme Specific Outcomes**

<b>CO \ PSO</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>
<b>CO1</b>	H	M	S	S	M
<b>CO2</b>	S	H	S	S	M
<b>CO3</b>	S	M	S	H	M
<b>CO4</b>	H	S	H	M	M
<b>CO5</b>	M	S	H	M	M

**S** - Strong; **H** - High; **M** - Medium; **L** – Low

<b>Programme Code:</b>	B.Sc.	<b>Programme Title:</b>	Mathematics	
<b>Course Code:</b>	19UBPH02	<b>Course Title:</b>	<b>Batch:</b>	2019
<b>Total Hours:</b>	90	Allied Core Physics - II for Mathematics	<b>Semester:</b>	II
			<b>Credits:</b>	4.0

### Course Objective

#### The course aims

- To impart the diverse atom models and dual nature of light.
- To study the concept of nucleus, radioactivity and cosmic rays.
- To learn basics of electronic and digital electronic circuits.

### Course Outcome

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

Knowledge Level	CO Number	Course Outcome
<b>K1, K2, K3, K4, K5</b>	<b>CO1</b>	Gain knowledge on the various atom models and their principles.
	<b>CO2</b>	Identify, formulates and solve problems in wave mechanics
	<b>CO3</b>	Enhance knowledge in the field of atomic nucleus and radioactivity
	<b>CO4</b>	Understand electronic devices, operational amplifier and logic gates.

**K1** - Remember; **K2** - Understanding; **K3** - Apply; **K4** - Analyze; **K5** – Evaluate

SYLLABUS		
Unit	Content	No. of Hours
<b>I</b>	<b>STRUCTURE OF ATOM:</b> Sommerfeld's relativistic atom model – fine structure of $H_{\alpha}$ line – Vector atom model – spatial quantization concept of electron spin, orbital and spin angular momentum and magnetic momentum of electron – quantum numbers of vector atom model – Pauli exclusion principle – electronic configuration of atoms.	<b>18</b>
<b>II</b>	<b>WAVE MECHANICS:</b> De Broglie's concept of matter waves – De Broglie wavelength - characteristics of the De Broglie's matter waves - calculation of de-Broglie wavelength of material particles like electrons - wave velocity and group velocity for de-Broglie waves - Experimental study of matter waves – G.P.Thomson's experiment - Heisenberg's uncertainty principle – Experimental verification: Diffraction of an electron beam through a slit.	<b>18</b>
<b>III</b>	<b>NUCLEAR PHYSICS:</b> Classification of Nuclei – properties of nucleus – Binding energy – stability – Nuclear forces – meson theory of nuclear forces – models of Nuclear structure : Liquid drop model – shell model (qualitative). <b>RADIOACTIVITY:</b> Saddy-Fajan's displacement law – Natural radio active series – law of radioactive disintegration – mean life – radio active dating – age of the earth. <b>COSMIC RAYS:</b> Lattitude, azimuth and altitude effect- primary and secondary cosmic rays – cosmic ray showers- Van Allen belts – Origin of cosmic rays – Pair production.	<b>18</b>
<b>IV</b>	<b>ELECTRONICS:</b> Construction, characteristics of Zener diode - Applications of	<b>18</b>

	<p>Zener diode – LED - photodiode - Stages in a regulated dc power supply - Full wave bridge rectifier – working efficiency - Ripple factor and Advantages of a full wave bridge rectifier - Filters – capacitor filter - choke filter and <math>\pi</math>-filter – Voltage regulation – Zener – regulator circuit - Half – wave voltage Doubler circuit.</p> <p><b>OP-AMP:</b> Circuit symbol - polarity conventions and virtual ground or summing point of an operational amplifier - inverting and non-inverting amplifier - operational amplifier as an adder, subtractor, differentiator, integrator and comparator.</p>	
V	<p><b>DIGITAL ELECTRONICS</b></p> <p><b>NUMBER CONVERSION:</b> Decimal, Binary, Octal and Hexa Decimal number system.</p> <p><b>ARITHMETIC OPERATIONS:</b> Binary Addition, Binary Subtraction by complements method, Binary Multiplication and Binary Division.</p> <p><b>LOGIC GATES:</b> Logic symbol – Action – Truth tables of AND, OR, NOT, NAND, NOR, XOR and XNOR gates - DE Morgan's theorem and its proof - Laws in Boolean Algebra – Simplification of Boolean expressions – Logic diagram for Boolean expression – truth table construction – NAND and NOR gates as a universal gates.</p>	18

<\* *Self Study: Physical Significance of Heisenberg's uncertainty relation, Half Wave Rectifier.*>

#### Text Books:

1. R.Muruugesan and Kiruthiga Sivaprasath, Modern Physics, 2018 edition, S Chand & Company Ltd., New Delhi.
2. B.L.Therasa, Basic ELelectronics, 2005 edition, S.Chand & Company Ltd., New Delhi.
3. V.Vijayendran Introduction to Integrated Electronics , 2009 edition, Viswanathan S Printers & Publisher (P) Ltd. Chennai.

#### Reference Books:

1. B,Rajam Atomic Physics , 2007 edition, Chand & Company Ltd., New Delhi,
2. R.S. Sedha A Text book of Applied Electronics S.Chand & Company (P) Ltd, New Delhi.
3. Donald P Leach, Albert paul Malvino and Goutham Saha Digital Principles and Applications, 2011 edition, Tata Megraw Hill Education (P) Ltd , New Delhi.

#### E- references:

1. [https://chem.libretexts.org/Courses/Purdue/Purdue3A\\_Chem\\_26505%3A\\_Organic\\_Chemistry\\_I\\_\(Lipton\)/Chapter\\_1.\\_Electronic\\_Structure\\_and\\_Chemical\\_Bonding/1.01\\_Electronic\\_Configuration\\_of\\_Atoms](https://chem.libretexts.org/Courses/Purdue/Purdue3A_Chem_26505%3A_Organic_Chemistry_I_(Lipton)/Chapter_1._Electronic_Structure_and_Chemical_Bonding/1.01_Electronic_Configuration_of_Atoms)
2. <https://winnerscience.com/2011/11/05/de-broglie-concept-of-matter-waves-dual-nature-of-matter/>
3. <https://byjus.com/physics/nuclear-force/>
4. <https://gradeup.co/operational-amplifiers-1-i-a852fd70-84ce-11e7-90b2-30b4a876cab4>
5. [https://edurev.in/studytube/Chapter-7-Boolean-Algebra--Chapter-Notes--Class-12/238677ed-448e-47c8-97b6-c4ed71b6e87f\\_t](https://edurev.in/studytube/Chapter-7-Boolean-Algebra--Chapter-Notes--Class-12/238677ed-448e-47c8-97b6-c4ed71b6e87f_t)

### Mapping with Programme Specific Outcomes

<b>CO \ PSO</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>
<b>CO1</b>	S	H	S	S	S
<b>CO2</b>	S	S	S	S	H
<b>CO3</b>	S	H	S	H	M
<b>CO4</b>	S	S	H	S	H

**S** - Strong; **H** - High; **M** - Medium; **L** – Low

<b>Programme Code:</b>	B.Sc.	<b>Programme Title:</b>	Mathematics	
<b>Course Code:</b>	19UBPHP1	<b>Course Title:</b>	<b>Batch:</b>	2019
<b>Total Hours:</b>	90	Allied Core Physics Practical	<b>Semester:</b>	II
			<b>Credits:</b>	2.0

### Course Objective

#### The course aims

- To understand the physical phenomena and fundamentals of general physics.
- To acquire the practical knowledge in the area of mechanics, properties of matter, optics, electricity and magnetism.
- To validate the practical result with theory.

### Course Outcome

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

Knowledge Level	CO Number	Course Outcome
<b>K1, K2, K3, K4, K5</b>	<b>CO1</b>	Ability to develop basic experiments and analyze the relation between theory and experimental results
	<b>CO2</b>	Plan the experimental procedure, record and interpret the results.
	<b>CO3</b>	The hands on exercises to apply physics principles to evaluate physical parameters
	<b>CO4</b>	Compute the experimental investigations of mechanical, heat and optical physics

**K1** - Remember; **K2** - Understanding; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate

SYLLABUS (COVERING SEMESTER – I & II)		
Unit	Content	No. of Hours
	<u>Any Sixteen Experiments:</u> <ol style="list-style-type: none"> <li>1. Young's modulus – Non uniform bending – Pin &amp; Microscope.</li> <li>2. Young's modulus – Uniform bending – Pin &amp; Microscope.</li> <li>3. Young's modulus – Static Cantilever.</li> <li>4. Rigidity modulus – Static Torsion.</li> <li>5. Rigidity modulus – Torsional Pendulum.</li> <li>6. <math>Y, n</math> &amp; <math>\sigma</math> – Searle's method.</li> <li>7. Acceleration due to gravity – Compound Pendulum.</li> <li>8. Specific heat of a liquid – Cooling Method.</li> <li>9. Thermal conductivity – Lee's Disc method.</li> </ol>	<b>90</b>

	<p>10. Joule's Calorimeter.</p> <p>11. Sonometer – A. C. Frequency.</p> <p>12. Spectrometer – Solid Prism.</p> <p>13. Spectrometer – Hollow Prism.</p> <p>14. Spectrometer – Grating – Minimum Deviation.</p> <p>15. Newton's Rings – Radius of Curvature.</p> <p>16. Air Wedge – Thickness of a wire.</p> <p>17. Meter Bridge – Specific Resistance.</p> <p>18. Meter Bridge – Temperature Co-efficient.</p> <p>19. Potentiometer – Ammeter – Calibration.</p> <p>20. Potentiometer – Low Range – Voltmeter – Calibration.</p> <p>21. Moment of magnet – TanC Position.</p> <p>22. Moment of magnet – Circuit Coil.</p> <p>23. Characteristics of Junction &amp; Zener Diodes.</p> <p>24. Verification of Truth Tables of Logic Gates: AND, OR, NOT, NAND and NOR.</p> <p>25. Verification of Demorgan's theorems – digital ICs.</p>	
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### Mapping with Programme Outcomes

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
<b>CO1</b>	S	S	S	S	H
<b>CO2</b>	H	S	M	S	S
<b>CO3</b>	S	S	S	S	S
<b>CO4</b>	H	M	S	S	S

**S** - Strong; **H** - High; **M** - Medium; **L** – Low

## **Question Paper Pattern**

(Common for Major, Allied, Allied Optional and Major Optional Papers)

### **For EOS Examinations: 70 Marks**

The Question Paper is to be divided into THREE Sections.

Section-A Carries 15 Marks, Section-B Carries 25 Marks and Section-C Carries 30 Marks.

Section-A Contains 15 Multiple Choice Questions. (15 x 1 = 15 Marks)

Three Questions from each unit. (Q. No: 1 to 15)

Section-B Contains 5 Either or Choice Questions. (5 x 5 = 25)

Each Question carries 5 Marks. Both (a) and (b) from the same unit.

Q. No.: 16 (a) or (b) to 20(a) or (b)

Section-C Contains 5 Questions out of which, 3 Questions are to be answered. (3 x 10 = 30)

Each Question carries 10 Marks. One Question from each unit. Q. No.: 21 to 25

### **For CIA Examinations: 30 Marks**

Section-A: 10 Multiple Choice Questions. (10 x 1 = 10)

Section-B: Two Questions out of Three. (2 x 5 = 10)

Section-C: One Question out of Two. (1 x 10 = 10)