



KONGU ARTS AND SCIENCE COLLEGE

(An Autonomous Institution, Affiliated to Bharathiar University, Coimbatore)

ERODE – 638 107

PROGRAM NAME
M.Sc. (Mathematics)



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2018-2019



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SYLLABUS

Sem	Course Code	Elective Paper - III (B)	Total Marks :100		Hours Per Week	Credits
III	17PBEET306	MATHEMATICAL PHYSICS	CIA : 25	ESE :75	5	4

OBJECTIVE:

To enable the students to understand the concepts of special functions and their relevance in Mathematical Physics.

COURSE OUTCOME:

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

- CO1 understand the concept of tensors.
- CO2 discuss Riemann-Christoffel's tensor and Einstein gravitational equation.
- CO3 explain Beta, Gamma and Error Functions.
- CO4 discuss Hankel Transforms.
- CO5 discuss Maxwell's Electromagnetic Field Equations and Special Theory of Relativity.

UNIT I

Tensors: Introduction - Transformation of coordinates - The summation convention and Kronecker delta symbol - Tensors classification of transformation laws - Symmetric and anti-symmetric tensors - Invariant tensors- Rules which govern tensor analysis - The fundamental tensors -Length of a vector , angle between two vectors and orthogonality of vectors - Metric tensor, Riemannian spaces.

UNIT II

Tensors: Christoffel's 3-Index symbols - Equation of a Geodesic - Law of transformation for Christoffel's symbols -Parallel displacement of vectors - Covariant derivative of a vector - Covariant derivative of a tensor - The curvature, tensor, (Riemann-Christoffel's tensor) - Riemann-Christoffel's tensor or covariant curvature tensor - Some important results - Tensor forms of operators - Einstein gravitational equation.

UNIT III

Beta, Gamma and Error Functions: Definitions - Fundamental property of gamma functions- The value of $\Gamma(\frac{1}{2})$ and graph of the gamma function - Transformation of gamma function - To show that $\beta(m,n) = \beta(n,m)$ - Different forms Beta function - To find the relation between Beta and Gamma function -Reduction to definite integral to gamma functions - Error function or probability integral - Factorial function - Some allied functions - Orthogonal sets of functions.

UNIT IV

Hankel Transforms: Introduction - definition of Infinite Hankel Transform - Inverse formula for Hankel Transform - Parseval's theorem for Hankel Transform - Linearity Property - Hankel Transform of the derivative of Function - Hankel Transform of $\frac{d^3 f}{dx^3}, \frac{d^2 f}{dx^2} + \frac{1}{x} \frac{df}{dx}$ and $\frac{d^2 f}{dx^2} + \frac{1}{x} \frac{df}{dx} - x f$ under certain conditions - Applications to boundary value problems .



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UNIT V

Maxwell's Electromagnetic Field Equations: Introduction - Maxwell's equations for electromagnetic field - To show $\nabla \cdot D = 4\pi\rho$ - To show $\text{div } \mathbf{B} = 0$ - To show $\text{curl } \mathbf{E} = -\frac{1}{c} \frac{\partial \mathbf{B}}{\partial t}$ -

Physical interpretation of Maxwell's equations - Decaying recharge - Poynting vector -

Poynting theorem

Special Theory of Relativity : Introduction - Basic postulates of special theory of relativity - Lorentz transformations - The kinematics effects of the Lorentz transformations - Energy momentum relation.

TEXT BOOK:

B.D.Gupta, "Mathematical Physics", Fourth Edition, Vikas Publishing House Pvt Ltd. , New Delhi, 2010.

UNIT I : Chapter 3 - Sections 3.1 - 3.11

UNIT II : Chapter 3 - Sections 3.12 - 3.22

UNIT III: Chapter 6 - Sections 6.1 - 6.13

UNIT IV: Chapter 11 - Sections 11.1 - 11.8

UNIT V : Chapter 13 - Sections 13.1 - 13.9 and 14.1 - 14.5

BOOKS FOR REFERENCE:

1. A.K. Ghatak and I.C.Goyal , S.J. Chua, "Mathematical Physics -Differential Equations and Transform Theory", McMillan India Ltd., New Delhi, Reprint 2012.
2. B.S.Rajput, "Mathematical Physics", 26th Edition, Pragati Prakashan, New Delhi, 2013.
3. H.K.Dass and Dr.Rama Verma, "Mathematical Physics", S.Chand & Company Private Ltd , New Delhi, Reprint 2016.

QUESTION PAPER PATTERN		
SECTION - A	SECTION - B	SECTION - C
10x1=10 Marks (Multiple choice, Four options) Two questions from each unit	5 x 7 = 35 Marks (Either or choice) Two questions from each unit	3x10 = 30 Marks (Answer any three questions) One question from each unit



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Sem	Course Code	Core Paper -XV	Total Marks :100		Hours Per Week	Credits
IV	17PBECT403	PROGRAMMING MATH WITH PYTHON(THEORY)	CIA : 25	ESE :75	4	4

OBJECTIVE:

To enable the students to understand the concepts of Python programming which is used to explore Algebra, Sets and Probability, Data with Graphs and Statistics.

COURSE OUTCOME:

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

- CO1 write different kinds of numbers by getting user input.
- CO2 visualize data with graphs.
- CO3 describe data with statistical tools.
- CO4 define algebra symbolic math with SYMPY.
- CO5 interpret results from sets and probability.

UNIT-I

Working with Numbers: Basic mathematical operations - Labels - Different kinds of numbers- Getting user input - Writing programs that do the math for you.

UNIT-II

Visualizing Data with Graphs: Understanding the Cartesian coordinate plane - Working with list and tuples - Creating graphs with Matplotlib -Plotting with formulas.

UNIT-III

Describing Data with Statistics: Finding the mean - Finding the median - Finding the mode and creating a frequency table - Measuring the dispersion - Calculating the correlation between two data sets - Scatter Plots - Reading data from files.

UNIT-IV

Algebra and Symbolic Math with SYMPY: Defining symbols and symbolic operations - Working with expressions - Solving equations - Plotting using SYMPY.

UNIT-V

Playing with Sets and Probability: What is set? - Set Construction - Subsets, Super Sets and Power sets - Set Operations

Probability: Probability of an event A or B - Probability of an event A and B - Generating random numbers - Non uniform random numbers.




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TEXT BOOK:

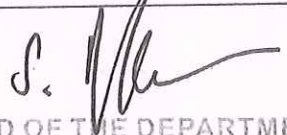
Amit and Saha, "Doing Math with PYTHON", William Pollock, San francisco, 2015.

- UNIT I : Chapter 1 : Page No. 1- 22
UNIT II : Chapter 2 : Page No. 27 - 54
UNIT III : Chapter 3 : Page No. 61 - 89
UNIT IV : Chapter 4 : Page No. 93 - 115
UNIT V : Chapter 5 : Page No. 121- 140


BOOKS FOR REFERENCE:

1. Paul Barry "Head First Python", Shroff Publishers and Distributors Pvt. Ltd, New Delhi, 2017.
2. Mike Mcgrath, "Python", Mcgraw Hill Education (India) Pvt. Ltd, New Delhi, 2013.

QUESTION PAPER PATTERN		
SECTION - A	SECTION - B	SECTION - C
10x1=10 Marks (Multiple choice, Four options) Two questions from each unit	5 x 7 = 35 Marks (Either or choice) Two questions from each unit	3x10 = 30 Marks (Answer any three questions) One question from each unit


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Sem	Course Code	Core Paper -XVI	Total Marks :100		Hours Per Week	Credits
IV	17PBEC404	PROGRAMMING MATH WITH PYTHON (PRACTICAL)	CIA : 40	ESE :60	4	4

OBJECTIVE:

To enable the students to understand the concepts of Python Programming to gain practical knowledge in Sets and Probability, Statistics and Data with graphs.

COURSE OUTCOME:

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

- CO1 write programs to distinguish the kinds of numbers.
- CO2 visualize Statistics with Graphs.
- CO3 list the first N Fibonacci numbers.
- CO4 find correlation coefficient.
- CO5 show the pictorial results from Sets and Probability.

1. Write a program for conversion from temperature Celsius to Fahrenheit.
2. Write a program for finding the roots of quadratic function.
3. Write a program to check the even or odd numbers.
4. Write a program to draw a graph which shows the relationship between gravitational force and distance between two bodies.
5. Write a program to draw the trajectory of a body in projectile motion.
6. Write a program to draw a horizontal bar chart.
7. Write a program to list the first N Fibonacci numbers.
8. Write a program to calculate mean, median and mode.
9. Write a program to find the variance and standard deviation.
10. Write a program to find the correlation coefficient.
11. Write a program to solve a system of two equations.
12. Write a program to draw a Venn diagram for two sets.
13. Write a program to find the probability of a prime number appearing when a 20 sided die is rolled.

TEXT BOOK:

Amit and Saha, "Doing Math with PYTHON", nostra press, William Pollock, Sanfrancisco, 2015.

BOOKS FOR REFERENCE:

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