

**Scheme of M.Sc. Mathematics Program under Semester System**  
**Program Code& Name: DPMS03 - M.Sc. (Mathematics)**

**Session 2024-25**

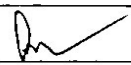
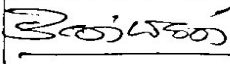
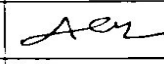
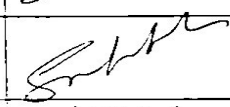
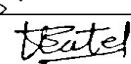
Semester	Course Code	Course Name	Credit			Total Credit	Marks			
			L	T	P		ESE	CIA	Total	
									MAX	MIN
First	MMAT -101	Advanced Abstract Algebra	3	1	-	4	70	30	100	40
	MMAT -102	Mathematical Analysis-I	3	1	-	4	70	30	100	40
	MMAT -103	Topology -I	3	1	-	4	70	30	100	40
	MMAT -104	Complex Analysis -I	3	1	-	4	70	30	100	40
	MMAT -105	Advanced Discrete Mathematics-I	3	1	-	4	70	30	100	40
		<b>Total</b>	<b>20</b>	<b>350</b>	<b>150</b>	<b>500</b>	<b>200</b>			
Second	MMAT -201	Advanced Abstract Algebra -II	3	1	-	4	70	30	100	40
	MMAT -202	Mathematical Analysis -II	3	1	-	4	70	30	100	40
	MMAT -203	Topology -II	3	1	-	4	70	30	100	40
	MMAT -204	Complex Analysis -II	3	1	-	4	70	30	100	40
	MMAT -205	Advanced Discrete Mathematics-II	3	1	-	4	70	30	100	40
		<b>Total</b>	<b>20</b>	<b>350</b>	<b>150</b>	<b>500</b>	<b>200</b>			
Third	MMAT - 301	Integration Theory and Functional Analysis -I	3	1	-	4	70	30	100	40
	MMAT -302	Partial Differential Equations , & Gravitation	3	1	-	4	70	30	100	40
	MMAT - 303	Fuzzy sets and their Application – I	3	1	-	4	70	30	100	40
	MMAT - 304	Operations Research – I	3	1	-	4	70	30	100	40
	MMAE- 305	Fluid Mechanics- I	3	1	-	4	70	30	100	40
	MMAE- 306	Fundamental of computer science	3	1	-	4	70	30	100	40
	MMAE- 307	Numerical Analysis	3	1	-	4	70	30	100	40
		<b>Total</b>	<b>20</b>	<b>350</b>	<b>150</b>	<b>500</b>	<b>200</b>			
Fourth	MMAT - 401	Integration Theory and Functional Analysis -II	3	1	-	4	70	30	100	40
	MMAT - 402	Classical Mechanics & Gravitation	3	1	-	4	70	30	100	40
	MMAT - 403	Fuzzy sets and their Application - II	3	1	-	4	70	30	100	40
	MMAT - 404	Operations Research – II	3	1	-	4	70	30	100	40
	MMAE- 405	Fluid Mechanics- II	3	1	-	4	70	30	100	40
	MMAE- 406	Number Theoryand Cryptography	3	1	-	4	70	30	100	40
	MMAE- 407	Spherical Harmonic	3	1	-	4	70	30	100	40
		<b>Total</b>	<b>20</b>	<b>350</b>	<b>150</b>	<b>500</b>	<b>200</b>			
		<b>Grand Total</b>	<b>80</b>	<b>1400</b>	<b>600</b>	<b>2000</b>	<b>800</b>			

Program Code and Name	<b>DPMS03, M.Sc.(Mathematics)</b>			Semester	<b>IV</b>
Exam Code and Name	<b>2034 - M.Sc .MATHEMATICS FOURTH SEMESTER</b>			Paper	<b>I</b>
Course Code	MMAT -401			Course Type	<b>T</b>
Course Title	Integration Theory and Functional Analysis -II				
Total Credit	<b>4</b>				
Total Marks	CIA: 30	ESE: 70	Max Marks: 100	Min. Pass. Marks: 40	
Prerequisites (if any)					
Course Outcomes	<p>The end of this course, the students will be able to:</p> <ol style="list-style-type: none"> <li>1. Banach Space, Normed and Banach Space, Bounded Linear Operators.</li> <li>2. Hilbert Spaces, Spectral Theory, Measure Spaces, Extension Theorem.</li> <li>3. Measure Spaces, Signed Measure, Absolute Continuity and Singularity of Measures</li> <li>4. Lebesgue Decomposition Theorem and Random Nikodym Theorem..</li> </ol>				

<b>Contents of Course</b>		
<b>Unit</b>	<b>Contents</b>	<b>No. of Period</b>
I	Uniform Boundedness Theorem and some of its consequences, Open Mapping and Closed Graphs Theorems, Hahn-Banach Theorem for Real Linear Spaces Complex Linear Spaces and Normed Linear Spaces.	15
II	Reflexive Spaces, Weak Sequential Compactness, Compact Operators, Solvability of Linear Equations in Banach Spaces(Fredholm Alternatives), The Closed Range Theorem, Inner Product Spaces, Hilbert Spaces, Orthonormal Sets, Bessel's Inequality, Complete Orthonormal Sets and Parseval's Identity.	15
III	Structure of Hilbert Spaces, Projection Theorem, Riesz Representation Theorem, Adjoint of an Operator on a Hilbert Space. Reflexivity of Hilbert Spaces	15
IV	Self -adjoint Operators. Positive, Projection, Normal and Unitary Operators, Abstract Variational Boundary- Value Problems, The Generalised Lax-Milgram Theorem.	15
	Total no. of Lectures	60

Text books	1 Integration Theory andFunctional Analysis
	<p><b>Reference Books:</b></p> <ul style="list-style-type: none"> <li>• Lebesgue Integration, J.H.Williamson, Holt Rinehart and Wintson, Inc ,New York 1962.</li> <li>• Measure Theory , P.R Halmos, Van Nostrand, princeton 1950.</li> <li>• Functional Analysis . B.V. Limye, Wiley Eastern Ltd. 1981.</li> <li>• Functional Analysis with application , A Siddiqui, Tata Mc Graw Hill Publishing Company New Delhi.</li> </ul> <p><b>E-Resources</b>  <a href="https://onlinecourses.nptel.ac.in">https://onlinecourses.nptel.ac.in</a>  <a href="https://epqp.inflibnet.ac.in">https://epqp.inflibnet.ac.in</a> <a href="https://swayam.gov.in">https://swayam.gov.in</a>.</p>

Assessment and Evaluation		
Suggested Continuous Evaluation Methods:		
Maximum Marks: 100 Marks	Continuous Internal Assessment (CIA): 30 Marks	End Semester Exam (ESE) : 70 Marks
Continuous Internal Assessment (CIA)	Internal Test/Quiz- (2): 20 & 20 Assignment / Seminar: 10 Total Marks: 30	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against <b>30</b> Marks
End Semester Exam (ESE)	<b>Three Section - A, B &amp; C</b> Section A: Q1. Objective- 10 x 1 = 10 Mark; Section B: Long Answer type questions 1 out of 2 from each unit- 4 x 5 = 20 Marks; Section C: Descriptive answer type questions 1 out of 2 from each unit- 4 x 10 = 40 Marks;	


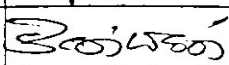
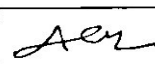
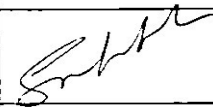
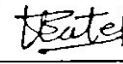
Sr. no	Member Name	Signature
1.	Dr. P. P. Murthy Professor, Guru Ghasidas Vishwavidyalaya Bilaspur	
2.	Dr. S.K.Tiwari Professor Head , Department of Mathematics . Dr. C.V.Raman University Kota Bilaspur	
3.	Dr. Sanjay Kumar Professor G.B.Pant University Uttarkhand	
4	Dr. Ashutosh Pandey Asst.Prof. D.P.Vipra P.G.College Bilaspur	
5.	Dr.smt. Snehalata Mishra Asst. Prof. Head , Department of Mathematics, D.P.Vipra P.G.College Bilaspur	
6.	Bhupesh Patel. Ex-Student. D.P.Vipra P.G.College Bilaspur	
7		
8.		

Program Code and Name	<b>DPMS03, M.Sc.(Mathematics)</b>			Semester	<b>IV</b>
Exam Code and Name	<b>2034 - M.Sc .MATHEMATICS FOURTH SEMESTER</b>			Paper	<b>II</b>
Course Code	MMAT -402			Course Type	<b>T</b>
Course Title	Classical Mechanics and Gravitation				
Total Credit	<b>4</b>				
Total Marks	CIA: 30	ESE: 70	Max Marks: 100	Min. Pass. Marks: 0 4	
Prerequisites (if any)					
Course Outcomes	<p>The end of this course, the students will be able to:</p> <ol style="list-style-type: none"> <li>1. Gain Knowledge of deriving and applying equation of motion ,</li> <li>2. Gain Concepts of Mechanics Variation Principle,</li> <li>3. Lagrange's Formula and their application</li> <li>4. Gain the basis ideas of turbulence..</li> </ol>				

<b>Contents of Course</b>		
<b>Unit</b>	<b>Contents</b>	<b>No. of Period</b>
I	Generalised co-ordinates, Holonomic and non-holonomic systems, scleronomic and Rheonomic system, Generalised Potentials Lagrange's equations of first kind, Lagrange's equations of second kind. Uniqueness of solution, Energy equation for conservation fields.	15
II	Hamilton's variable, Hamilton canonical equations, cyclic coordinates, Routh's equations. Poisson's Bracket, Poisson's identity, Jacobi-Poisson theorem, Lagrange's bracket.	15
III	Motivating problems of calculus of variations Shortest distance Minimum surface of revolution, Brachistochrone problem, isoperimetric problem, Geodesic, Fundamental lemma of calculus of variations, Euler's equation for one dependent function and its generalization to (i) independent functions, (ii) higher order derivatives, Conditional extremum under geometric constraints and under integral constraints.	15
IV	Potential of rod, disc, spherical shell and sphere, spherical shell of finite thickness, Distributions for a given potential, Equipotential surfaces, Surface and solid harmonics, Surface density in terms of surface harmonics.	15
	Total no. of Lectures	60

Text books	1. Classical Mechanics and Gravitation
	<p><b>Reference books</b></p> <ul style="list-style-type: none"> <li>• D. Raisinghania: Ordinary and Partial Differential Equation, S Chand Publication, New Delhi</li> <li>• S L. Loney: An Elementary Treatise On Statics, University Press.</li> <li>• N. Sneddon: Partial Differential Equation, McGraw Hill Book Co. Ltd,</li> <li>• H. Goldstein: Classical Mechanics, Addison Wesley.</li> <li>• Narayan Chandra Rana &amp; Pramod Sharad, Chandra Joag: Classical Mechanics. Tata</li> <li>• McGraw-Hill Publishing Company, 1991.</li> </ul> <p><b>E-Resources:</b></p> <ul style="list-style-type: none"> <li>• <a href="https://onlinecourses.nptelnac.in">https://onlinecourses.nptelnac.in</a></li> <li>• <a href="https://epgpminflibnet.ac.in">https://epgpminflibnet.ac.in</a> <a href="https://swayam.qov.in">https://swayam.qov.in</a></li> </ul>

Assessment and Evaluation		
Suggested Continuous Evaluation Methods:		
Maximum Marks: 100 Marks	Continuous Internal Assessment (CIA): 30 Marks	End Semester Exam (ESE) : 70 Marks
Continuous Internal Assessment (CIA)	Internal Test/Quiz- (2): 20 & 20 Assignment / Seminar: 10 Total Marks: 30	Better marks out of the two Test / Quiz + obtained marks is Assignment shall be considered against <b>30</b> Marks
End Semester Exam (ESE)	<b>Three Section - A, B &amp; C</b> Section A: Q1. Objective- 10 x 1 = 10 Mark; Section B: Long Answer type questions 1 out of 2 from each unit- 4 x 5 = 20 Marks; Section C: Descriptive answer type questions 1 out of 2 from each unit- 4 x 10 = 40 Marks;	

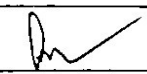
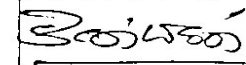
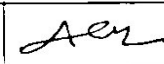
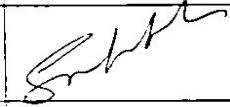
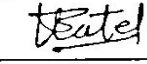
Sr. no	Member Name	Signature
1.	Dr. P. P. Murthy Professor, Guru Ghasidas Vishwavidyalaya Bilaspur	
2.	Dr. S.K. Tiwari Professor Head , Department of Mathematics . Dr. C.V.Raman University Kota Bilaspur	
3.	Dr. Sanjay Kumar Professor G.B.Pant University Uttarkhand	
4	Dr. Ashutosh Pandey Asst.Prof. D.P.Vipra P.G.College Bilaspur	
5.	Dr.smt. Snehalata Mishra Asst. Prof. Head , Department of Mathematics, D.P.Vipra P.G.College Bilaspur	
6.	Bhupesh Patel. Ex-Student. D.P.Vipra P.G.College Bilaspur	
7		
8.		

Program Code and Name	<b>DPMS03, M.Sc.(Mathematics)</b>			Semester	<b>IV</b>
Exam Code and Name	<b>2034 - M.Sc .MATHEMATICS FOURTH SEMESTER</b>			Paper	<b>III</b>
Course Code	MMAT -403			Course Type	<b>T</b>
Course Title	Fuzzy sets and their Application - II (Optional)				
Total Credit	<b>4</b>				
Total Marks	CIA: 30	ESE: 70	Max Marks: 100	Min. Pass. Marks: 4 <sup>0</sup>	
Prerequisites (if any)					
Course Outcomes	<p>The end of this course, the students will be able to:</p> <ol style="list-style-type: none"> <li>1. Gain competency to illustrate fuzzy relations.</li> <li>2. fuzzy measures and to classify possibility</li> <li>3. necessity measures. determine decision making in fuzzy environments.</li> <li>4. fuzzy logic fuzzy inference system. fuzzy inference system.</li> </ol>				

<b>Contents of Course</b>		
<b>Unit</b>	<b>Contents</b>	<b>No. of Period</b>
I	Possibility Theorem- Fuzzy measures, evidence theory, possibility theory versus probability theory.	15
II	Fuzzy Logic- An overview of classical logic, Multivalued logics, Fuzzy propositions, Fuzzy quantifiers, Linguistic Hedges, inference from conditional and qualified fuzzy proposition, the compositional rule of inference.	15
III	Approximate reasoning- An overview of fuzzy expert systems, Fuzzy implications and their selection, multi conditional approximate reasoning the role of fuzzy relation equations.	15
IV	An introduction to fuzzy control-Fuzzy controllers, Fuzzy rule base, Fuzzy inference engine, fuzzification, defuzzification and various defuzzification methods(the center of area, the center of maxima and the mean of maxima methods).Decision making in Fuzzy EnvironmenGindividual decision making, multi person decision making, multi criteria decision aaking, multistage decision making, Fuzzy ranking methods, Fuzzy linear programming.	15
	Total no. of Lectures	60

Text books	Fuzzy sets and their Application - II (Optional)
	<p><b>Reference books :</b></p> <ol style="list-style-type: none"> <li>1. Dr. A. K. Bhargava: Fuzzy set Theory, Fuzzy Logic and Their Applications, S. Chand Publication, New Delhi.</li> <li>2. S. K. Pundir and R. Pundir : Fuzzy Sets and Their .Applications, Pragati Publication Meerut.</li> </ol> <p><b>E-Resources:</b></p> <ul style="list-style-type: none"> <li>• <a href="https://onlinecourses,,nptel.ac.in">https://onlinecourses,,nptel.ac.in</a></li> <li>• <a href="https://epqp.inflibnet.ac.in">https://epqp.inflibnet.ac.in</a></li> <li>• <a href="https://swayam.gov.in">https://swayam.gov.in</a> R. Chai Carpara Governance</li> <li>• Medury, Uma Corporate Goeman Frumsock</li> <li>• Mas Alarsa, Corporate Gove</li> <li>• Kumar Basant, Non-Executive Directors in Indian Corporate Governance</li> <li>• Markar &amp; Sarkar, Corporate Governance in India</li> </ul>

Assessment and Evaluation		
Suggested Continuous Evaluation Methods:		
Maximum Marks: 100 Marks	Continuous Internal Assessment (CIA): 30 Marks	End Semester Exam (ESE) : 70 Marks
Continuous Internal Assessment (CIA)	Internal Test/Quiz- (2): 20 & 20 Assignment / Seminar: 10 Total Marks: 30	Better marks out of the two Test / Quiz + obtained marks is Assignment shall be considered against 30 Marks
End Semester Exam (ESE)	<b>Three Section - A, B &amp; C</b> Section A: Q1. Objective- 10 x 1 = 10 Mark; Section B: Long Answer type questions 1 out of 2 from each unit- 4 x 5 = 20 Marks; Section C: Descriptive answer type questions 1 out of 2 from each unit- 4 x 10 = 40 Marks;	

Sr. no	Member Name	Signature
1.	Dr. P. P. Murthy Professor, Guru Ghasidas Vishwavidyalaya Bilaspur	
2.	Dr. S.K.Tiwari Professor Head , Department of Mathematics . Dr. C.V.Raman University Kota Bilaspur	
3.	Dr. Sanjay Kumar Professor G.B.Pant University Uttarkhand	
4	Dr. Ashutosh Pandey Asst.Prof. D.P.Vipra P.G.College Bilaspur	
5.	Dr.smt. Snehalata Mishra Asst. Prof. Head , Department of Mathematics, D.P.Vipra P.G.College Bilaspur	
6.	Bhupesh Patel. Ex-Student. D.P.Vipra P.G.College Bilaspur	
7		
8.		

Program Code and Name	<b>DPMS03, M.Sc.(Mathematics)</b>			Semester	<b>IV</b>
Exam Code and Name	<b>2034 - M.Sc .MATHEMATICS FOURTH SEMESTER</b>			Paper	<b>IV</b>
Course Code	MMAT -404			Course Type	<b>T</b>
Course Title	Operations Research – II (Optional)				
Total Credit	<b>4</b>				
Total Marks	CIA: 30	ESE: 70	Max Marks: 100	Min. Pass. Marks: 40	
Prerequisites (if any)					
Course Outcomes	<p>The end of this course, the students will be able to:</p> <ol style="list-style-type: none"> <li>1. Best strategy using decision mapping methods under uncertainty and game theory.</li> <li>2. Gain knowledge of non-linear programming</li> <li>3. Computational performance unconstrained and constrained problems, optimization</li> <li>4. Real life system with limited constraints and depict it in a model form.</li> </ol>				

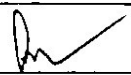
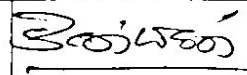

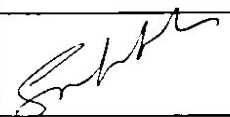

<b>Contents of Course</b>		
<b>Unit</b>	<b>Contents</b>	<b>No. of Period</b>
I	Dynamic Programming- Deterministic and Probabilistic Dynamic Programming.	15
II	Game. Theory- Two-Person, Zero-Sum Games, Games with Mixed Strategies, Graphical Solution, Solution by Linear Programming.	15
III	Integer Programming Branch and Bound Technique, Pure and mixed, Gomory's cutting plane method. Queuing system- Deterministic Queuing system, probability distribution in Queuing, classification of Queuing models, Poisson Queuing system ((M/M/I)( $\alpha$ /FIFO), (M/M/I) (/SIRO) (M/M/I) (N/FIFO)); Inventory control The concept of EOQ, Deterministic inventory)problem with no shortages.	15
IV	Nonlinear Programming- (one/ Multi-Variable Unconstrained Optimization, Kuhn-Tucker Conditions for Constrained Optimization, Quadratic Programming, Separable Programming, Convex Programming, Non-convex Programming.	15
	Total no. of Lectures	60

Text books	1. Operations Research – II (Optional)
	<p><b>Reference Books:</b></p> <ul style="list-style-type: none"> <li>• P. K. Gupta D. S. Hira.: Operations Research ,S Chand &amp; Co. Ltd, New Delhi.</li> <li>• H, A. Taha, Operations Research an Introduction, Macmillan publishing INC., NewYork.</li> <li>• F. S. Hillier&amp; G.J. Lieberman, Introduction to Operations Research, (sixth- edition). McGraw Hill International Edition.</li> </ul> <p><b>E-Resources:</b></p> <ul style="list-style-type: none"> <li>• <a href="https://onlinecourses.nptel.ac.in">https://onlinecourses.nptel.ac.in</a></li> <li>• <a href="https://epqp.inflibnet.ac.in">https://epqp.inflibnet.ac.in</a></li> <li>• <a href="https://swayam.gov.in">https://swayam.gov.in</a></li> </ul>

**Assessment and Evaluation**

Suggested Continuous Evaluation Methods:

Maximum Marks: 100 Marks	Continuous Internal Assessment (CIA): 30 Marks	End Semester Exam (ESE) : 70 Marks
Continuous Internal Assessment (CIA)	Internal Test/Quiz- (2): 20 & 20 Assignment / Seminar: 10 Total Marks: 30	Better marks out of the two Test / Quiz + obtained marks is Assignment shall be considered against <b>30</b> Marks
End Semester Exam (ESE)	<b>Three Section - A, B &amp; C</b> Section A: Q1. Objective- 10 x 1 = 10 Mark; Section B: Long Answer type questions 1 out of 2 from each unit- 4 x 5 = 20 Marks; Section C: Descriptive answer type questions 1 out of 2 from each unit- 4 x 10 = 40 Marks;	

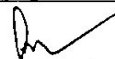
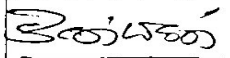
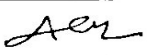

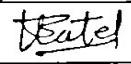
Sr. no	Member Name	Signature
1.	Dr. P. P. Murthy Professor, Guru Ghasidas Vishwavidyalaya Bilaspur	
2.	Dr. S.K.Tiwari Professor Head , Department of Mathematics . Dr. C.V.Raman University Kota Bilaspur	
3.	Dr. Sanjay Kumar Professor G.B.Pant University Uttarkhand	
4	Dr. Ashutosh Pandey Asst.Prof. D.P.Vipra P.G.College Bilaspur	
5.	Dr.smt. Snehalata Mishra Asst. Prof. Head , Department of Mathematics, D.P.Vipra P.G.College Bilaspur	
6.	Bhupesh Patel. Ex-Student. D.P.Vipra P.G.College Bilaspur	
7		
8.		

Program Code and Name	<b>DPMS03, M.Sc.(Mathematics)</b>			Semester	<b>IV</b>
Exam Code and Name	<b>2034 - M.Sc .MATHEMATICS FOURTH SEMESTER</b>			Paper	<b>V</b>
Course Code	MMAE -405			Course Type	<b>T</b>
Course Title	Fluid Mechanics II (Optional)				
Total Credit	<b>4</b>				
Total Marks	CIA: 30	ESE: 70	Max Marks: 100	Min. Pass. Marks: 40	
Prerequisites (if any)					
Course Outcomes	<p>The end of this course, the students will be able to:</p> <ol style="list-style-type: none"> <li>Equation of motion, motion in two Dimensions, motion of Cylinders.</li> <li>Dynamics of Fluid Flow and governing Nondimensional parameters.</li> <li>Gain knowledge of deriving and applying equation of motion.</li> <li>Gain the basic ideas of Turbulence.</li> </ol>				

<b>Contents of Course</b>		
<b>Unit</b>	<b>Contents</b>	<b>No. of Period</b>
I	Motion in three dimension- Motion of a sphere in a liquid at rest at infinity, Liquid streaming past a fixed sphere, Concentric sphere, Equation of motion of a sphere, Stoke's stream function.1974.	15
II	Vortex motion- Vortex motion and its elementary properties, Kelvin' proof Conservation of velocity, Strength of a vortex tube. Rectilinear vortices with circular and elliptic section, Pressure distribution, Rankine combine vortex, Vortex Pair, Image of a Vortex filamen in a plane, Karman street	15
III	Wave motion of an ideal fluid- Wave motion of an ideal fluid and its properties Progressive waves on the. surface of a canal and deep canal, Standing waves, Energy of progressive waves, Reduction of progressive waves to a steady motion, Capillary waves, velocity, Waves in Pathan interface with surface free, Long gravity waves, group velocity, path of articles.	15
IV	Stress, Strain and The Navier -Stokes equation : Stress component of real fluid Relation between rectangular component of Stress in a real fluid, normal strain, strain component, connection between stress and gradient of velocity. The Navier Stokes equation, equation of motion in other coordinate system. Motion of Elliptic Cylinder- Streaming past a fixed Elliptic cylinder, Rotating elliptic cylinder, Kinetic energy, Circulation.	15
	Total no. of Lectures	60

Text books	1. Fluid Mechanics II (Optional)
	<p><b>Reference books :</b></p> <ul style="list-style-type: none"> <li>Part C An introduction to Fluid Dynamics, R. K. Rathy, Oxford and IBH Company, New Delhi,1976</li> <li>An Introduction to Fluid Mechnics, G. K. Batchelor, Foundation Books New Delhi.</li> <li>Boundary Layers, A.D. Young, AIAA Education Series, Washington DC, 1989.</li> </ul> <p><b>E-Resources:</b></p> <ul style="list-style-type: none"> <li><a href="https://onlinecourses.nptel.ac.in">https://onlinecourses.nptel.ac.in</a></li> <li><a href="https://epqp.inflibnet.ac.in">https://epqp.inflibnet.ac.in</a> <a href="https://swayam.gov.in">https://swayam.gov.in</a></li> </ul>

Assessment and Evaluation		
Suggested Continuous Evaluation Methods:		
Maximum Marks: 100 Marks	Continuous Internal Assessment (CIA): 30 Marks	End Semester Exam (ESE) : 70 Marks
Continuous Internal Assessment (CIA)	Internal Test/Quiz- (2): 20 & 20 Assignment / Seminar: 10 Total Marks: 30	Better marks out of the two Test / Quiz + obtained marks is Assignment shall be considered against <b>30</b> Marks
End Semester Exam (ESE)	<b>Three Section - A, B &amp; C</b> Section A: Q1. Objective- 10 x 1 = 10 Mark; Section B: Long Answer type questions 1 out of 2 from each unit- 4 x 5 = 20 Marks; Section C: Descriptive answer type questions 1 out of 2 from each unit- 4 x 10 = 40 Marks;	


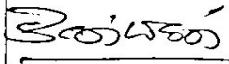

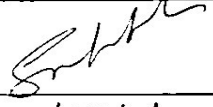
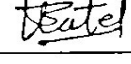
Sr. no	Member Name	Signature
1.	Dr. P. P. Murthy Professor, Guru Ghasidas Vishwavidyalaya Bilaspur	
2.	Dr. S.K.Tiwari Professor Head , Department of Mathematics . Dr. C.V.Raman University Kota Bilaspur	
3.	Dr. Sanjay Kumar Professor G.B.Pant University Uttarkhand	
4	Dr. Ashutosh Pandey Asst.Prof. D.P.Vipra P.G.College Bilaspur	
5.	Dr.smt. Snehalata Mishra Asst. Prof. Head , Department of Mathematics, D.P.Vipra P.G.College Bilaspur	
6.	Bhupesh Patel. Ex-Student. D.P.Vipra P.G.College Bilaspur	
7		
8.		

Program Code and Name	<b>DPMS03, M.Sc.(Mathematics)</b>			Semester	<b>IV</b>
Exam Code and Name	<b>2034 - M.Sc .MATHEMATICS FOURTH SEMESTER</b>			Paper	<b>V</b>
Course Code	MMAE -406			Course Type	<b>T</b>
Course Title	Number Theory and Cryptography (Optional)				
Total Credit	<b>4</b>				
Total Marks	CIA: 30	ESE: 70	Max Marks: 100	Min. Pass. Marks: 40	
Prerequisites (if any)					
Course Outcomes	<p>The end of this course, the students will be able to:</p> <ol style="list-style-type: none"> <li>1. Elementary ideas from number theory which will have application in cryptology.</li> <li>2. Identify and apply various properties of and relating to the integers including</li> <li>3. The wellordering principle ,primes , unique factorization the division algorithm.</li> <li>4. Encryption and decryption techniques, managing the security of data.</li> </ol>				

<b>Contents of Course</b>		
<b>Unit</b>	<b>Contents</b>	<b>No. of Period</b>
I	Elementary number Theory- Divisibility and Euclidean Algorithm, Congruence applications to factoring, time Estimates for doing arithmetic.	15
II	Cryptography Some simple crypto systems , Enciphering matrices. Finite fields and quadratic residues, quadratic residues and reciprocity.	15
III	Public key Cryptography- the idea of public key cryptography, RSA, Discrete log, knapsack.	15
IV	Primality and factoring : pseudo primes, the rho method , fermat factorization and factor bases. The continued fraction method. The quadratic sieve method	15
	Total no. of Lectures	60

Text books	1. Number Theory and Cryptography (Optional)
	<p><b>Reference books :</b></p> <ol style="list-style-type: none"> <li>1. Niven and Zuckermann, An Introduction to theory of numbers (Edn.3) Wiley Eastern Ltd. New Delhi 1976.</li> <li>2. David M. Burton, Elementary number Theory, Wm C.Brown Publishers, Dubuque Iowa 1989.</li> <li>3. K.Ireland and M.Rosen, A classical Introduction to modern number theory Springer Verlag 1972.</li> <li>4. J.Bucmann, Introduction to cryptography , second Edition (2005) Springer.</li> </ol> <p><b>E-Resources:</b></p> <p><a href="https://onlinecourses.nptel.ac.in">https://onlinecourses.nptel.ac.in</a>  <a href="https://epqp.inflibnet.ac.in">https://epqp.inflibnet.ac.in</a>  <a href="https://swayam.gov.in">https://swayam.gov.in</a></p>

Assessment and Evaluation		
Suggested Continuous Evaluation Methods:		
Maximum Marks: 100 Marks	Continuous Internal Assessment (CIA): 30 Marks	End Semester Exam (ESE) : 70 Marks
Continuous Internal Assessment (CIA)	Internal Test/Quiz- (2): 20 & 20 Assignment / Seminar: 10 Total Marks: 30	Better marks out of the two Test / Quiz + obtained marks is Assignment shall be considered against <b>30</b> Marks
End Semester Exam (ESE)	<b>Three Section - A, B &amp; C</b> Section A: Q1. Objective- 10 x 1 = 10 Mark; Section B: Long Answer type questions 1 out of 2 from each unit- 4 x 5 = 20 Marks; Section C: Descriptive answer type questions 1 out of 2 from each unit- 4 x 10 = 40 Marks;	


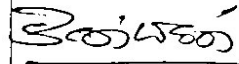

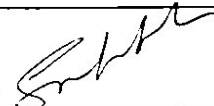
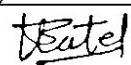
Sr. no	Member Name	Signature
1.	Dr. P. P. Murthy Professor, Guru Ghasidas Vishwavidyalaya Bilaspur	
2.	Dr. S.K.Tiwari Professor Head , Department of Mathematics . Dr. C.V.Raman University Kota Bilaspur	
3.	Dr. Sanjay Kumar Professor G.B.Pant University Uttarkhand	
4	Dr. Ashutosh Pandey Asst.Prof. D.P.Vipra P.G.College Bilaspur	
5.	Dr.smt. Snehalata Mishra Asst. Prof. Head , Department of Mathematics, D.P.Vipra P.G.College Bilaspur	
6.	Bhupesh Patel. Ex-Student. D.P.Vipra P.G.College Bilaspur	
7		
8.		

Program Code and Name	<b>DPMS03, M.Sc.(Mathematics))</b>			Semester	<b>IV</b>
Exam Code and Name	<b>2034 - M.Sc .MATHEMATICS FOURTH SEMESTER</b>			Paper	<b>V</b>
Course Code	MMAE -407			Course Type	<b>T</b>
Course Title	Spherical Harmonic (Optional)				
Total Credit	<b>4</b>				
Total Marks	CIA: 30	ESE: 70	Max Marks: 100	Min. Pass. Marks: 40	
Prerequisites (if any)					
Course Outcomes	<p>The end of this course, the students will be able to:</p> <ol style="list-style-type: none"> <li>1. Mathematical properties of spherical harmonics, including their orthogonality and completeness.</li> <li>2. Spherical harmonics to solve problems in quantum mechanics, hydrogen atom problem.</li> <li>3. Spherical harmonics to represent and analyze functions on a sphere.</li> <li>4. Quantum mechanics, signal processing, and real-time rendering.</li> </ol>				

Contents of Course		
Unit	Contents	No. of Period
I	Legendre's Equation- Legendre's equation (Def), solution of Legendre's Equation, Definition of $P_n(x)$ and $Q_n(x)$ , General solution of Legendre's equation, to show that $P_n(x)$ is the coefficient of $h^n$ in the expansion of $(1-2xh+h^2)^{-1/2}$ Orthogonal properties of Legendre's polynomials, Recurrence formulae, Expansion of $x^n$ in Legendre's polynomial's , general results	15
II	Legendre's function of the second kind $Q_n(x)$ , Legendre's function of the second kind, Neumann's Integral, Recurrence formulae for $Q_n(x)$ , Relation between $P_n(x)$ and $Q_n(x)$ ,	15
III	Hypergeometric functions- Hypergeometric functions, Gauss's hypergeometric equation, Particular cases of hypergeometric series, different forms of hypergeometric function, symmetric property of hypergeometric function, Kummer's theorem, Gauss's theorem.	15
IV	Bessel's equation (def), Solution of Bessel's general differential equation , General solution of Bessel's equation, Intergration of Bessel's equation in series for $n=0$ , Definition of $J_n(x)$ , Recurrence formulae for $J_n(x)$ , Generating function for $J_n(x)$ A second solution of Bessel's equation	15
	Total no. of Lectures	60

Text books	1. Spherical Harmonic (Optional)
	<p><b>Reference books :</b></p> <ul style="list-style-type: none"> <li>• Spherical Harmonics in p Dimensions by Costas Efthimiou and Christopher Frye,</li> <li>• Spherical Harmonics and approximations of the unit sphere: An introduction "by Kendall</li> <li>• Atkinson and Weimin Han and Spherical Harmonics by Claus Muller. 7. Special funtions , J.N.Sharma &amp; R.K.Gupta ,</li> </ul> <p><b>E-Resources:</b></p> <p><a href="https://onlinecourses,,nptel.ac.in">https://onlinecourses,,nptel.ac.in</a>  <a href="https://epqp.inflibnet.ac.in">https://epqp.inflibnet.ac.in</a>  <a href="https://swayam.qov.in">https://swayam.qov.in</a></p>

<b>Assessment and Evaluation</b>		
Suggested Continuous Evaluation Methods:		
Maximum Marks: 100 Marks	Continuous Internal Assessment (CIA): 30 Marks	End Semester Exam (ESE) : 70 Marks
Continuous Internal Assessment (CIA)	Internal Test/Quiz- (2): 20 & 20 Assignment / Seminar: 10 Total Marks: 30	Better marks out of the two Test / Quiz + obtained marks is Assignment shall be considered against <b>30</b> Marks
End Semester Exam (ESE)	<b>Three Section - A, B &amp; C</b> Section A: Q1. Objective- 10 x 1 = 10 Mark; Section B: Long Answer type questions 1 out of 2 from each unit- 4 x 5 = 20 Marks; Section C: Descriptive answer type questions 1 out of 2 from each unit- 4 x 10 = 40 Marks;	

Sr. no	Member Name	Signature
1.	Dr. P. P. Murthy Professor, Guru Ghasidas Vishwavidyalaya Bilaspur	
2.	Dr. S.K.Tiwari Professor Head , Department of Mathematics . Dr. C.V.Raman University Kota Bilaspur	
3.	Dr. Sanjay Kumar Professor G.B.Pant University Uttarkhand	
4	Dr. Ashutosh Pandey Asst.Prof. D.P.Vipra P.G.College Bilaspur	
5.	Dr.smt. Snehalata Mishra Asst. Prof. Head , Department of Mathematics, D.P.Vipra P.G.College Bilaspur	
6.	Bhupesh Patel. Ex-Student. D.P.Vipra P.G.College Bilaspur	
7		
8.		