

# PONDICHERRY UNIVERSITY

(A CENTRAL UNIVERSITY)



## **B.Sc. MATHEMATICS (CBCS)**

**REGULATIONS & SYLLABUS**

**2017-2018 ONWARDS**

# **PONDICHERRY UNIVERSITY**

## ***CHOICE BASED CREDIT SYSTEM***

### **Course Structure**

#### **For B.Sc. Mathematics Programme**

**Offered in Affiliated Colleges of Pondicherry University from the  
Academic Year**

**2017-18 Onwards**

## **Eligibility Criteria for Admission to B.Sc Mathematics**

1. A pass in Higher secondary with Mathematics (not Business Mathematics) as one of the subjects of study.
2. For the definitions of Keywords, Grading and Computation of SGPA and CGPA, refer guidelines for choice based credit system of UG Programmes in Arts, Science and Commerce, issued by Pondicherry University from the academic year 2017-18.

**SCHEME FOR CHOICE BASED CREDIT SYSTEM**

IN

**B.Sc. MATHEMATICS PROGRAMME**

(To be implemented from 2017-18 onwards)

COURSE	SUBJECT CODE	TITLE OF THE PAPER	CREDITS	
			Lecture	Tut/Prac
<b>SEMESTER-I 20 Credits</b>				
MIL – 1	LBEN/LHIN/LMAL/LSAN/LTAM/LTEL 111	Bengali/Hindi/Malayalam/Sanskrit/Tamil/Telugu	03	
ENGLISH – 1	ENGL 112	English – I	03	
DSC – 1A	MATH 111	Theory of Equations and Trigonometry	04	02
DSC – 2A	MATH 112	Differential Calculus	04	02
AECC – 1	PADM 113	Public Administration	02	
<b>SEMESTER-II 20 Credits</b>				
MIL – 2	LBEN/LHIN/LMAL/LSAN/LTAM/LTEL 121	Bengali/Hindi/Malayalam/Sanskrit/Tamil/Telugu	03	
ENGLISH – 2	ENGL 122	English – II	03	
DSC – 1B	MATH 121	Analytical Geometry – 3	04	02
DSC – 2B	MATH 122	Integral Calculus	04	02
AECC – 2	ENVS 123	Environmental Studies	02	
<b>SEMESTER-III 20 Credits</b>				
MIL – 3	LBEN/LHIN/LMAL/LSAN/LTAM/LTEL 111	Bengali/Hindi/Malayalam/Sanskrit/Tamil/Telugu	03	
ENGLISH – 3	ENGL 232	English – III	03	
DSC – 1C	MATH (231)	Abstract Algebra	04	02
DSC – 2C	MATH (232)	Real Analysis - I	04	02
SEC – 1	MATH (233)	Logic and Lattices	02	
<b>SEMESTER-IV 20 Credits</b>				
MIL – 4	LBEN/LHIN/LMAL/LSAN/LTAM/LTEL 111	Bengali/Hindi/Malayalam/Sanskrit/Tamil/Telugu	03	
ENGLISH – 4	ENGL 242	English – IV	03	
DSC – 1D	MATH (241)	Linear Algebra	04	02
DSC – 2D	MATH (242)	Real Analysis - II	04	02
SEC – 2	MATH (243)	Vector Calculus	02	
<b>SEMESTER-V 20 Credits</b>				
SEC – 3	MATH (351)	Programming Using SciLab- Practical		02
*DSE – 1A *DSE – 2A *DSE – 3A	MATH (352)	Complex Analysis - I	04	01
	MATH (353)	Operations Research - I	04	01
	MATH (354)	Ordinary Differential Equations	04	01
	MATH (355)	Statics	04	01
	MATH (356)	Mathematical Statistics - I	04	01
GE – 1	MATH (357)	Programming using SCILAB	03	
<b>SEMESTER-VI 20 Credits</b>				
SEC – 4	MATH (361)	Programming Lab in Numerical methods - Practicals		02
*DSE – 1B *DSE – 2B *DSE – 3B	MATH (362)	Complex Analysis -II	04	01
	MATH (363)	Operations Research - II	04	01
	MATH (364)	Partial Differential Equations	04	01
	MATH (365)	Dynamics	04	01
	MATH (366)	Mathematical Statistics - II	04	01
GE – 2	MATH (367)	Numerical Methods	03	

### LIST OF DISCIPLINE SPECIFIC CORE COURSES

(THEORY: 4 CREDITS AND TUTORIAL: 2 CREDITS)

8 \* 6 = 48 Credits

COURSE NAME	PAPER CODE	TITLE OF THE PAPER
DSC – 1A	MATH 111	Theory of equations and Trigonometry
DSC – 2A	MATH 112	Differential Calculus
DSC – 1B	MATH 121	Analytical Geometry of 3D
DSC – 2B	MATH 122	Integral Calculus
DSC - 1C	MATH 231	Abstract Algebra
DSC – 2C	MATH 232	Real Analysis -1
DSC – 1D	MATH 241	Linear Algebra
DSC – 2D	MATH 242	Real Analysis -II

### LIST OF SKILL-ENHANCEMENT ELECTIVE COURSES (SEC)

(2 CREDITS FOR EACH PAPER)

4\* 2= 8 credits

COURSE NAME	PAPER CODE	TITLE OF THE PAPER
SEC-1	MATH 233	Logic and Lattices
SEC-2	MATH 243	Vector Calculus
SEC-3	MATH 351	Programming Using SCILAB - Practical
SEC-4	MATH 361	Programming Lab in Numerical methods - Practicals

**LIST OF DISCIPLINE SPECIFIC ELECTIVES (DSE)**

**(THEORY: 4 CREDITS AND TUTORIAL: 1 CREDIT) 6 \* 5 = 30 Credits**

<b>COURSE NAME</b>	<b>PAPER CODE</b>	<b>TITLE OF THE PAPER</b>
<b>DISCIPLINE – A*</b> <b>DSE – 1A</b> <b>DSE – 2A</b> <b>DSE – 3A</b>	<b>MATH 352</b>	<b>Complex Analysis - I</b>
	<b>MATH 353</b>	<b>Operations Research - I</b>
	<b>MATH 354</b>	<b>Ordinary Differential Equations</b>
	<b>MATH 355</b>	<b>Statics</b>
	<b>MATH 356</b>	<b>Mathematical Statistics - I</b>
<b>DISCIPLINE – B*</b> <b>DSE – 1B</b> <b>DSE – 2B</b> <b>DSE – 3B</b>	<b>MATH 362</b>	<b>Complex Analysis - II</b>
	<b>MATH 363</b>	<b>Operations Research - II</b>
	<b>MATH 364</b>	<b>Partial Differential Equations</b>
	<b>MATH 365</b>	<b>Dynamics</b>
	<b>MATH 366</b>	<b>Mathematical Statistics - II</b>

**\*Select 3 courses from each of the DISCIPLINE – A and DISCIPLINE -B**

**LIST OF GENERIC ELECTIVE (GE)**

**(THEORY: 3 CREDITS) 2 \* 3 = 6 Credits**

<b>COURSE NAME</b>	<b>PAPER CODE</b>	<b>TITLE OF THE PAPER</b>
<b>GE – 1</b>	<b>MATH 357</b>	<b>Programming Using SCILAB</b>
<b>GE -2</b>	<b>MATH 367</b>	<b>Numerical Methods</b>

**CHOICE BASED CREDIT SYSTEM IN  
B.Sc. MATHEMATICS PROGRAMME  
To be implemented from 2017-18 onwards**

**Distribution of Workload  
(one credit hour is equivalent 1.5 hours)**

SEMESTER	SUBJECT CODE	TITLE OF THE PAPER	CREDITS		CONTACT HOURS / WEEK	
			THEORY	TUT	THEORY	TUT
I ( 20 Credits)	LBEN/LHIN/ LMAL/LSAN/ LTAM/LTEL 111	Bengali/Hindi/ Malayalam/ Sanskrit/Tamil/ Telugu	03	-	5	0
	ENGL 112	ENGLISH – I	03		5	0
	MATH 111	Theory of Equation and Trigonometry	04	02	6	3
	MATH 112	Differential Calculus	04	02	6	3
	PADM 113	Public Administration	02	-	2	0
II ( 20 Credits)	LBEN/LHIN/ LMAL/LSAN/ LTAM/LTEL 121	Bengali/Hindi/ Malayalam/Sanskrit/ Tamil/Telugu	03	-	5	0
	ENGL 122	ENGLISH – II	03	-	5	0
	MATH 121	Analytical Geometry of 3D	04	02	6	3
	MATH 122	Integral calculus	04	02	6	3
	ENVS 123	Environmental Studies	02	-	2	0

SEMESTER	SUBJECT CODE	TITLE OF THE PAPER	CREDITS		CONTACT HOURS / WEEK	
			THEORY	TUT	THEORY	TUT
III ( 20 Credits)	LBEN/LHIN/ LMAL/LSAN/ LTAM/LTEL 231	Bengali/Hindi/ Malayalam/ Sanskrit/Tamil/ Telugu - III	03	-	5	0
	ENGL 232	ENGLISH – III	03		5	0
	MATH (231)	Abstract Algebra	04	02	6	3
	MATH (232)	Real Analysis I	04	02	6	3
	MATH (233)	Logic and Lattices	02	-	3	0
IV ( 20 Credits)	LBEN/LHIN/ LMAL/LSAN/ LTAM/LTEL 241	Bengali/Hindi/ Malayalam/ Sanskrit/Tamil/ Telugu - IV	03	-	5	0
	ENGL 242	ENGLISH – IV	03		5	0
	MATH (241)	Linear Algebra	04	02	6	3
	MATH (242)	Real Analysis II	04	02	6	3
	MATH (243)	Vector Calculus	02	-	3	0

SEMESTER	SUBJECT CODE	TITLE OF THE PAPER	CREDITS		CONTACT HOURS / WEEK	
			THEORY	TUT/PRAC	THEORY	TUT/PRAC
V ( 20 Credits)  Select any three from MATH- 352 to MATH - 356	MATH (351)	Programming Using SCILAB- Practical	--	02	0	4
	MATH (352)	Complex analysis - I	04	01	6	1
	MATH (353)	Operations Research - I	04	01	6	1
	MATH (354)	Ordinary differential Equations	04	01	6	1
	MATH (355)	Statics	04	01	6	1
	MATH (356)	Mathematical Statistics-I	04	01	6	1
	MATH (357)	Programming using SCILAB	03	--	5	0

SEMESTER	SUBJECT CODE	TITLE OF THE PAPER	CREDITS		CONTACT HOURS / WEEK	
			THEOR Y	TUT/PRAC	THEORY	TUT/PR AC
VI ( 20 Credits)  Select any three from MATH- 362 to MATH - 366	MATH (361)	Programming Lab in Numerical Methods - Practicals	--	02	0	4
	MATH (362)	Complex analysis - II	04	01	6	1
	MATH (363)	Operations Research – II	04	01	6	1
	MATH (364)	Partial Differential Equations	04	01	6	1
	MATH (365)	Dynamics	04	01	6	1
	MATH (366)	Mathematical Statistics-II	04	01	6	1
	MATH (367)	Numerical Methods	03	0	5	0



# **DETAILS OF SYLLABUS**

**For**

**B.Sc MATHEMATICS PROGRAMME**

*Under*

*CHOICE BASED CREDIT SYSTEM*

**Offered in affiliated Colleges of Pondicherry University from the academic  
year**

**2017-18 onwards**

<b>Degree</b>	<b>B.Sc</b>	<b>Branch</b>	<b>MATHEMATICS</b>			
<b>Year</b>	I	Course Name	DSC – 1A	Credits	Theory	4
<b>Semester</b>	I	Course Code	MATH 111		Tutorial	2
<b>Paper Name</b>	<b>THEORY OF EQUATIONS AND TRIGONOMETRY</b>					
<b>UNIT I</b>	Relations between the roots and the coefficients of a general polynomial equations in one variable – Transformation of equations – Descarte’s rule of signs.					
<b>UNIT II</b>	Solution of cubic equations :Cardon's Method - Trigonometrical method – Horner’s Method, Bi-quadratic equation – Ferrari method.					
<b>UNIT III</b>	De Moivre’s theorem and its applications – Direct and Inverse circular and hyperbolic functions.					
<b>UNIT IV</b>	Logarithm of a complex quantity- Expansion of Trigonometrical functions.					
<b>UNIT V</b>	Gregory's series- Summation of series.					
<b>Prescribed Text(specify sections clearly)</b>	<ol style="list-style-type: none"> <li>1. <i>Algebra Volume-1, T.K. Manicavachagom Pillay , T.Natarajan and K.S. Ganapathy,. Viswanathan (Printers &amp; Publishers) Pvt. Lid, (1999)</i></li> <li>2. <i>Trigonometry, S. Narayanan and T.K. Manicavachagom Pillai, S. Viswanathan (Printers &amp; Publishers) Pvt. Ltd, (1997)</i></li> </ol>					
<b>Recommended books</b>	<ol style="list-style-type: none"> <li>1. <i>Plane Trigonometry-Part-I&amp;II(6<sup>th</sup> Edition), S.L.Loney, Arihant Publications, 2016.</i></li> </ol>					
<b>e-Learning Source</b>	<a href="http://ndl.iitkgp.ac.in">http://ndl.iitkgp.ac.in</a> <a href="http://ocw.mit.edu">http://ocw.mit.edu</a> <a href="http://mathforum.org">http://mathforum.org</a>					

Degree	B.Sc	Branch	MATHEMATICS			
Year	I	Course Name	DSC -2A	Credits	Theory	4
Semester	I	Course Code	MATH 112		Tutorial	2
Paper Name	DIFFERENTIAL CALCULUS					
UNIT I	n <sup>th</sup> derivative – Standard results – Trigonometrical transformation – Formation of equations involving derivatives – Leibnitz formula.					
UNIT II	Total differential coefficients – Euler’s theorem - Partial derivatives of a function of two functions -Equations of tangent and normal - Taylor expansions of single and double variables.					
UNIT III	Maxima and Minima of two variables – Lagrange’s method of undetermined multipliers - Angle of intersection of curves – Sub tangent and Sub Normal. -					
UNIT IV	Angle between the radius vector and tangent – Angle between the intersection of two curves – Polar sub tangent and sub normal.					
UNIT V	Circle, radius and centre of curvature – Cartesian formula for radius of curvature – envelope.					
<i>Prescribed Text(specify sections clearly)</i>	<i>Calculus Volume — I, T. K. Manickavachagom Pillai, Printers and Publishers (May1992 Edition)</i> <i>Unit 1 : Chapter 3</i> <i>Unit 2: Chapter 8</i> <i>Unit 3 : Chapter 8, 9</i> <i>Unit 4 : Chapter 9</i> <i>Unit 5 : Chapter 10 (Section 1)</i>					
<i>Reference books</i>	1. <i>Calculus(2<sup>nd</sup> Edition), Lipman Bers and Frank Karal, Holt McDougal, 1976.</i> 2. <i>Thomas’ Calculus 12<sup>th</sup> Edition, George B.Thomas, Maurice D.Weir and Joel Hass, Pearson Education, 2015.</i>					
<i>e-Learning Source</i>	<a href="http://ndl.iitkgp.ac.in">http://ndl.iitkgp.ac.in</a> <a href="http://ocw.mit.edu">http://ocw.mit.edu</a> <a href="http://mathforum.org">http://mathforum.org</a>					

Degree	B.Sc	Branch	MATHEMATICS			
Year	I	Course Name	DSC – 1B	Credits	Theory	4
Semester	II	Course Code	MATH 121		Tutorial	2
Paper Name	ANALYTICAL GEOMETRY - 3D					
UNIT I	Angle between 2 lines-projections-direction cosines-relation between the direction cosines of a straight line-the projection of the line joining $P(x_1, y_1, z_1)$ and $Q(x_2, y_2, z_2)$ on any line with d.c.'s $l, m, n$ -direction cosines of any line joining 2 points-angle between the lines whose direction cosines are $(l_1, m_1, n_1)$ and $(l_2, m_2, n_2)$ .					
UNIT II	General equation, angle between two planes, length of perpendicular from a given point to a plane, equations of the plane bisecting the angle between two planes.					
UNIT III	Symmetrical form, line through two points, reduction of unsymmetrical form to the symmetrical form - condition for a line to lie on a plane - plane through a line - condition for the two lines to be coplanar (Cartesian form) - equation of the plane containing two lines - To find the shortest distance between two skew lines - equation of the shortest Distance in Cartesian.					
UNIT IV	Equation of a sphere with given centre and radius - general equation of a sphere - diameter form - and circular section.					
UNIT V	Equation of a Cone with its vertex at the origin - equation of a quadratic cone with given vertex and given guiding curve - necessary condition for general equation of second degree to represent a cone - circular cone - equation of circular cone with given vertex - axis and semi vertical angle.					
Prescribed Text (specify sections clearly)	1. <i>A Text Book of Analytical Geometry of Three dimensions</i> by T.K.Manickavachagom Pillai and T.Natarajan S. Viswanathan Printers & Publishers) — (2008)					
Reference books	1. <i>Text Book of Analytic Geometry -2D</i> , P. Durai Pandian, EMERALD Publishers (1968) 2. <i>Simplified Course in Solid Geometry(3D)</i> by H.K.Dasse, H.C.Saxena, M.D.Raisinghania – S.Chand & Company					
e-Learning Source	<a href="http://ndl.iitkgp.ac.in">http://ndl.iitkgp.ac.in</a> <a href="http://ocw.mit.edu">http://ocw.mit.edu</a> <a href="http://mathforum.org">http://mathforum.org</a>					

<b>Degree</b>	<b>B.Sc</b>	<b>Branch</b>	<b>MATHEMATICS</b>			
<b>Year</b>	I	Course Name	DSC -2B	Credits	Theory	4
<b>Semester</b>	II	Course Code	MATH 122		Tutorial	2
<b>Paper Name</b>	<b>INTEGRAL CALCULUS</b>					
<b>UNIT I</b>	Integration of rational algebraic functions – Integration of irrational algebraic functions - Properties of definite integrals					
<b>UNIT II</b>	Integration by parts – Bernoulli’s formula – Reduction formulae					
<b>UNIT III</b>	Evaluation of double integral – Changing of order of integration - Double integral in Polar co-ordinates – Triple integral					
<b>UNIT IV</b>	Jacobian – Change of variables in the case of two variable and three variables – Transformation from Cartesian to polar co-ordinate - Transformation from Cartesian to spherical co-ordinates -					
<b>UNIT V</b>	Properties – relation between Beta and Gamma functions - Recurrence formula					
<b>Prescribed Text(specify sections clearly)</b>	<i>Calculus Volume II , S.Narayanan and T.K. Manickavasagam Pillai (2008)</i> <i>Unit I : Chapter 1 : 7.3, 7.4, 7.5, 8, 11</i> <i>Unit II : Chapter 1: 12,13,</i> <i>Unit III: Chapter 5 : 2.1, 2.2, 3.1, 4</i> <i>Unit IV : Chapter 6: 1.1, 1.2, 2.1,2.2,2.3,2.4</i> <i>Unit v: Chapter 7: 2.1, 2.2, 2.3, 3, 4, 5</i>					
<b>Reference books</b>	<ol style="list-style-type: none"> <li>1. <i>Integral Calculus, N. P. Bali, Laxmi Publications, Delhi, (1991)</i></li> <li>2. <i>Calculus(2<sup>nd</sup> Edition), Lipman Bers and Frank Karal, Holt McDougal, 1976.</i></li> <li>3. <i>Thomas’ Calculus 12<sup>th</sup> Edition, George B.Thomas, Maurice D.Weir and Joel Hass, Pearson Education, 2015.</i></li> </ol>					
<b>e-Learning Source</b>	<a href="http://ndl.iitkgp.ac.in">http://ndl.iitkgp.ac.in</a> <a href="http://ocw.mit.edu">http://ocw.mit.edu</a> <a href="http://mathforum.org">http://mathforum.org</a>					

<b>Degree</b>	<b>B.Sc</b>	<b>Branch</b>	<b>MATHEMATICS</b>			
<b>Year</b>	II	Course Name	DSC -1C	Credits	Theory	4
<b>Semester</b>	III	Course Code	MATH 231		Tutorial	2
<b>Paper Name</b>	ABSTRACT ALGEBRA					
<b>UNIT I</b>	Definition of Group - examples of groups - Some preliminary lemmas - Subgroups.					
<b>UNIT II</b>	A counting principle - Normal subgroups and Quotient Groups – Homomorphisms.					
<b>UNIT III</b>	Automorphisms - Cayley's theorem - Permutation groups.					
<b>UNIT IV</b>	Definition of Ring- examples of a rings - Some special classes of rings - Homomorphisms – Ideals and quotients rings.					
<b>UNIT V</b>	More ideals and quotients rings -The field of quotients of an integral domain.					
<b>Prescribed Text(specify sections clearly)</b>	<i>I.N. Herstein, Topics in Algebra (Second Edition), John Wiley &amp; Sons (2003)</i> <i>Unit I : Sections 2.1 to 2.4</i> <i>Unit II : Sections 2.5 to 2.7(except applications 1 &amp; 2 of 2.7)</i> <i>Unit III: Sections 2.8 to 2.10</i> <i>Unit IV: Sections 3.1 to 3.3</i> <i>Unit V : Sections 3.4,3.6</i>					
<b>Reference Books</b>	<ol style="list-style-type: none"> <li>1. A First course in Algebra by J. B. Fraleigh, Addison Wesley.</li> <li>2. Modern Algebra by M.L. Santiago, (TMG)</li> <li>3. Abstract Algebra(3<sup>rd</sup> Edition), I.N.Herstein, John Wiley, 1996.</li> </ol>					
<b>e-Learning Source</b>	<a href="http://ndl.iitkgp.ac.in">http://ndl.iitkgp.ac.in</a> <a href="http://ocw.mit.edu">http://ocw.mit.edu</a> <a href="http://mathforum.org">http://mathforum.org</a>					

Degree	B.Sc	Branch	MATHEMATICS			
Year	II	Course Name	DSC - 2C	Credits	Theory	4
Semester	III	Course Code	MATH 232		Tutorial	2
<b>Paper Name</b>	REAL ANALYSIS - I					
<b>UNIT I</b>	Sets and elements — Operations on sets — Functions - Real valued functions - Equivalence — Countability — Real numbers — Least upper bound — Greatest lower bound.					
<b>UNIT II</b>	Definition of sequence and subsequence — Limit of a sequence — Convergent sequence — Bounded sequence Monotone sequence - Operation on convergent sequence - Limit superior and limit inferior — Cauchy sequence					
<b>UNIT III</b>	Convergence and divergence- Series with non - negative terms - Alternating series — Conditional convergence and absolute convergence - Tests for absolute convergence - Series whose terms form a non - increasing sequence — Summation by parts.					
<b>UNIT IV</b>	Limit of a function on the real line - Metric spaces (Examples 4 and 5 under 4.2 c to be omitted) - Limits in metric spaces.					
<b>UNIT V</b>	Functions continuous at a point on the real line Reformulation — Functions continuous on a metric space - Open sets and closed sets – Discontinuous functions on R					
<b>Prescribed Text(specify sections clearly)</b>	<i>Methods of Real Analysis, Treatment as in Richard R. Goldberg(1970)</i> Unit 1 : Chapter 1 Unit 2, 3: Chapter 2 and Chapter 3 (up to 3.8) Unit 4 : Chapter 4 Unit 5 : Chapter 5					
<b>Reference Books</b>	1. <i>A First Course in Mathematical Analysis- D somasundaram &amp; B Choudhyri- Narosa Publishing house New Dehli</i> 2. <i>Introduction to Calculus and Analysis, Vol.I, Richard Courant and Fritz John, Springer 1999.</i> 3. <i>Introduction to Real Analysis, 4<sup>th</sup> Edition, Robert G. Bartle and Donald R. Sherbert, Wiley-2014.</i>					
<b>e-Learning Source</b>	<a href="http://ndl.iitkgp.ac.in">http://ndl.iitkgp.ac.in</a> <a href="http://ocw.mit.edu">http://ocw.mit.edu</a> <a href="http://mathforum.org">http://mathforum.org</a>					

Degree	B.Sc	Branch	MATHEMATICS			
Year	II	Course Name	SEC - 1	Credits	Theory	2
Semester	III	Course Code	MATH 233		Tutorial	0
Paper Name	LOGIC AND LATTICES					
UNIT I	Connectives – negation – conjunction – disjunction – statement formulas and truth tables – Conditional and bi conditional - well formed formulas – tautologies – equivalence of formulas – duality law – tautological implications					
UNIT II	Normal forms – disjunctive normal forms – conjunctive normal forms – principal disjunctive normal forms – principal conjunctive normal forms					
UNIT III	Partial ordering – lexicographic ordering – Partially ordered set – Hasse diagram – least member – greatest member – minimal member – maximal member – least upper bound – greatest lower bound					
UNIT IV	Lattice – examples – properties of lattices – lattices as algebraic systems – sub lattices – direct product – homomorphism – order preserving – Special lattices – complete lattice – bounded lattice – complement –complemented lattice – distributive lattice					
UNIT V	Boolean algebra - - properties – examples – sub algebra – direct product – homomorphism – Boolean functions – karnaugh maps for one variable – two variables – three variables					
Prescribed Text(specify sections clearly)	<i>Discrete Mathematical structures with applications to computer science by J.P.Tremblay and R.Manohar</i> Unit 1: 1.1, 1.2.1 to 1.2.4, 1.2.6 to 1.2.12 Unit 2: 1.3.1 to 1.3.4 Unit 3: 2.3.8 to 2.3.9 Unit 4: 4.1.1 to 4.1.5 Unit 5: 4.2.1 to 4.2.2, 4.3.1 to 4.3.2, 4.4.1 to 4.4.2					
Reference Books	1. Lattice theory by Garrett Birkhoff 2. Discret Mathematics – M.K. Venkatraman, National Publishing Co, Chennai					
e-Learning Source	<a href="http://ndl.iitkgp.ac.in">http://ndl.iitkgp.ac.in</a> <a href="http://ocw.mit.edu">http://ocw.mit.edu</a> <a href="http://mathforum.org">http://mathforum.org</a>					



<b>Degree</b>	<b>B.Sc</b>	<b>Branch</b>	<b>MATHEMATICS</b>			
<b>Year</b>	II	Course Name	DSC -1D	Credits	Theory	4
<b>Semester</b>	IV	Course Code	MATH 241		Tutorial	2
<b>Paper Name</b>	LINEAR ALGEBRA					
<b>UNIT I</b>	Vector spaces - Elementary Concepts - subspaces					
<b>UNIT II</b>	Linear independence - Bases - Dual spaces					
<b>UNIT III</b>	Inner product spaces					
<b>UNIT IV</b>	Algebra of Linear transformations - Characteristic roots.					
<b>UNIT V</b>	Matrices : Canonical forms - triangular forms					
<b>Prescribed Text(specify sections clearly)</b>	<i>Topics in Algebra – I.N Herstein, Wiley Eastern Limited</i> <i>Chapter -4: Sections 4.1 – 4.4</i> <i>Chapter -5; Sections 6.1—6.4</i>					
<b>Reference Books</b>	1. <i>First course in Algebra - John B. Fraleigh, Addison Wesley</i> 2. <i>University Algebra – N. S. Gopalakrishnan - Wiley Eastern Limited</i> 3. <i>Textbook of Algebra – R. Balakrishnan &amp; N. Ramabadrana, Vikas Pub. Co</i> 4. <i>S. Lipschutz –Linear Algebra, TMG Hill</i> 5. <i>M.L.Santiago – Modern Algebra TMG Hill</i>					
<b>e-Learning Source</b>	<a href="http://ndl.iitkgp.ac.in">http://ndl.iitkgp.ac.in</a> <a href="http://ocw.mit.edu">http://ocw.mit.edu</a> <a href="http://mathforum.org">http://mathforum.org</a>					

Degree	B.Sc	Branch	MATHEMATICS			
Year	II	Course Name	DSC-2D	Credits	Theory	4
Semester	IV	Course Code	MATH 242		Tutorial	2
Paper Name	REAL ANALYSIS II					
UNIT I	More about open sets - Connected sets. Bounded sets and totally bounded sets - Complete metric spaces.					
UNIT II	Compact metric spaces Continuous functions on compact metric Spaces - Continuity of the inverse function - Uniform continuity.					
UNIT III	Sets of measure zero - Definition of the Riemann integral - Existence of the Riemann integral - Properties of the Riemann integral					
UNIT IV	Derivatives - Rolle's theorem - The Law of the Mean - Fundamental theorem of Calculus - - Improper integrals.					
UNIT V	Hyperbolic function - The exponential function - The logarithmic function - Definition of $x^a$ - The trigonometric function - Taylor Theorem -L'Hopital's rule.					
<b>Prescribed Text(specify sections clearly)</b>	<i>Methods of Real Analysis, Treatment as in Richard R. Goldberg, (1970)</i> Unit 1: 6.1 to 6.4 Unit 2: 6.5 to 6.8 Unit 3: 7.1 to 7.4 Unit 4: 7.5 to 7.10 Unit 5: 8.1 to 8.7					
<b>Reference Books</b>	1. <i>First Course in Mathematical Analysis by Dr.Somasundaram &amp; B Choudhyri- Narosa Publishing house New Dehli</i> 2. <i>Real Analysis- by Shanti Narayanan</i>					
<b>e-Learning Source</b>	<a href="http://ndl.iitkgp.ac.in">http://ndl.iitkgp.ac.in</a> <a href="http://ocw.mit.edu">http://ocw.mit.edu</a> <a href="http://mathforum.org">http://mathforum.org</a>					

<b>Degree</b>	<b>B.Sc</b>	<b>Branch</b>	<b>MATHEMATICS</b>			
<b>Year</b>	II	Course Name	SEC - 2	Credits	Theory	2
<b>Semester</b>	IV	Course Code	MATH 243		Tutorial	0
<b>Paper Name</b>	VECTOR CALCULUS					
<b>UNIT I</b>	Gradient of a scalar function –properties – directional derivatives – Divergence of a vector function – Curl of a vector function – related problems					
<b>UNIT II</b>	Vector identities – Line integrals – related problems					
<b>UNIT III</b>	Surface integrals – Volume integrals					
<b>UNIT IV</b>	Green’s theorem – Stokes’s theorem – Verification of theorems					
<b>UNIT V</b>	Gauss divergence theorem – Verification of theorem					
<b>Prescribed Text(specify sections clearly)</b>	1. <i>Vector Analysis- P.Duraipandian, LaxmiDuraipandian, Emerald Publishers pvt. Ltd. 1990</i>					
<b>Reference Books</b>	1. <i>Engineering Mathematics – II by Dr.M.B.K.Moorthy</i> 2. <i>Vector Analysis, Murray R. Spiegel, Seymour Lipschutz and Dennis Spellman, 2<sup>nd</sup> Edition, Schaum’s outline, McGraw Hill 2009.</i>					
<b>e-Learning Source</b>	<a href="http://ndl.iitkgp.ac.in">http://ndl.iitkgp.ac.in</a> <a href="http://ocw.mit.edu">http://ocw.mit.edu</a> <a href="http://mathforum.org">http://mathforum.org</a>					

<b>Degree</b>	<b>B.Sc</b>	<b>Branch</b>	<b>MATHEMATICS</b>			
<b>Year</b>	III	Course Name	SEC - 3	Credits	Theory	0
<b>Semester</b>	V	Course Code	MATH - 351		Practical	2
<b>Paper Name</b>	Programming Using SCILAB - Practicals					
<p align="center"><b>Scilab Programs have to be written for the following problems and executed to get desired output.</b></p> <ol style="list-style-type: none"> <li>1. To learn basic commands, SYNTAX</li> <li>2. SciLAB Programming, IO and strings, For loop, while loop, If-then-else construct.</li> <li>3. Line functions in SCiLAB, File Functions</li> <li>4. Graphics with Scilab-2D plot</li> <li>5. Graphics with Scilab-3D plot</li> <li>6. Matrix operations in Scilab</li> <li>7. Solving Linear system <math>AX=b</math></li> <li>8. Polynomials and its operations in Scilab</li> <li>9. Interpolation with cubic splines</li> <li>10. Solving ODEs using Scilab</li> </ol> <p><b>Text Book:</b></p> <ol style="list-style-type: none"> <li>1. <i>Scilab Textbook Companion for Numerical Methods For Scientists And Engineers</i> by K. S. Rao</li> </ol> <p><b>Reference Book:</b>  <a href="http://www.engineering.usu.edu/cee/faculty/gurro/Software_Calculators/Scilab_Docs/SCILAB_Notes&amp;Functions.htm">http://www.engineering.usu.edu/cee/faculty/gurro/Software_Calculators/Scilab_Docs/SCILAB_Notes&amp;Functions.htm</a></p>						
<b>e-Learning Source</b>	<a href="http://ndl.iitkgp.ac.in">http://ndl.iitkgp.ac.in</a> <a href="http://ocw.mit.edu">http://ocw.mit.edu</a> <a href="http://mathforum.org">http://mathforum.org</a> <a href="http://www.engineering.usu.edu/cee/faculty/gurro/Software_Calculators/Scilab_Docs/SCILAB_Notes&amp;Functions.htm">http://www.engineering.usu.edu/cee/faculty/gurro/Software_Calculators/Scilab_Docs/SCILAB_Notes&amp;Functions.htm</a>					

Degree	B.Sc	Branch	MATHEMATICS			
Year	III	Course Name	DSE	Credits	Theory	4
Semester	V	Course Code	MATH 352		Tutorial	1
<b>Paper Name</b>	<b>COMPLEX ANALYSIS – I</b>					
<b>UNIT I</b>	Complex numbers - Definitions - Algebraic properties - Cartesian co-ordinates - Triangular inequality - Polar Form - Powers and roots - Region in the complex plane .					
<b>UNIT II</b>	Analytic functions - Functions of a complex variable - Mapping - Limit - Theorems on limits - Continuity - Derivatives - Differentiation formula - Cauchy Riemann equations - Sufficient conditions.					
<b>UNIT III</b>	Cauchy Riemann equations in polar form - Analytic functions - Harmonic functions.					
<b>UNIT IV</b>	Elementary functions - Exponential function - Trigonometric functions and their--properties - Hyperbolic functions - Logarithmic function – Branches - properties of logarithms - Complex exponents - Inverse trigonometric & hyperbolic functions.					
<b>UNIT V</b>	Mapping by elementary functions - The linear function $1/z$ - Linear fractional transformation - The function $w = \exp(z)$ , $W = \sin z$ , $W = \cos z$ , $z^{1/2}$ - Successive transformation $W = z + 1/z$ .					
<b>Prescribed Text(specify sections clearly)</b>	<i>Complex Variables and Applications, James Ward Brown and Ruel V Churchill, McGraw - Hill, International Edition (2009)</i> UNIT I - chapter 1 UNIT II - chapter 2 UNIT III - chapter 2 UNIT IV - chapter 3 UNIT V - chapter 4					
<b>Reference Books</b>	<ol style="list-style-type: none"> <li>1. <i>Functions of a Complex variable by B. S. Tyagi – KedarNath Ram NathPublishers(P) Ltd.</i></li> <li>2. <i>Complex Analysis by P. Duraipandian and KayalalPachaiappa – S.Chand&amp; Co.</i></li> <li>3. <i>S. Ponnusamy, Foundations of Complex analysis, (2<sup>nd</sup> Edition), Narosa, 2011.</i></li> <li>4. <i>V.Karunakaran, Complex Analysis, (2<sup>nd</sup> Edition), Narosa 2005</i></li> </ol>					
<b>e-Learning Source</b>	<a href="http://ndl.iitkgp.ac.in">http://ndl.iitkgp.ac.in</a> <a href="http://ocw.mit.edu">http://ocw.mit.edu</a> <a href="http://mathforum.org">http://mathforum.org</a>					

Degree	B.Sc	Branch	MATHEMATICS			
Year	III	Course Name	DSE		Theory	4
Semester	V	Course Code	MATH 353	Credits	Tutorial	1
Paper Name	OPERATIONS RESEARCH - I					
UNIT I	Mathematical formulation of LPP – Graphical Solution of LPP – Definition of LPP – Canonical and Standard forms of LPP – Ordinary Simplex Method to solve LPP (Method and problems only) – Uses of Artificial variables Method (Big – M Method) - Two Phase Method					
UNIT II	Duality in LPP – Conversion of Primal to Dual – Duality and Simplex Method (Method and problems only) – Dual Simplex Method					
UNIT III	General Transportation Problems – Finding IBFS for Transportation Problems – North-West corner Method – Least Cost Method – Vogel’s approximation Method – Test for Optimality – Degeneracy in Transportation Problems – MODI Method – Unbalanced Transportation Problems					
UNIT IV	Mathematical formulation of Assignment Problems – Assignment Method – Travelling Salesman Problems					
UNIT V	Two person zero sum game – MAXIMIN – MINIMAX Principle – Saddle Point – Games without Saddle Point – Graphical solutions of $2 \times n$ and $m \times 2$ games – Dominance Property – General solution of $m \times n$ games by LPP					
<b>Prescribed Text(specify sections clearly)</b>	<i>Operations Research by KantiSwarup , P.K.Gupta and Man Mohan (2006)</i> <i>Unit I:Chapter 2: Sections 2.1 – 2.3, Chapter 3: Sections 3.1 – 3.5</i> <i>Chapter 4: Sections 4.1 – 4.4</i> <i>Unit 2: Chapter 5 : Sections 5.1 – 5.7, 5.9</i> <i>Unit3: Chapter 10: Sections 10.1 – 10.14</i> <i>Unit 4:Chapter 11: Sections 11.1 – 11.6</i> <i>Unit 5: Chapter 17: Sections 17.1 – 17.10</i>					
<b>Reference Books</b>	1. <i>Resource Management Techniques(Operations Research) by V. Sundaresan, K. S. Ganapathy Subramanian, K. Ganesan – A. R. Publications</i> 2. <i>Operations Research: An Introduction, 9<sup>th</sup> edition, Hamdy A.Taha, Pearson, 2010</i>					
<b>e-Learning Source</b>	<a href="http://ndl.iitkgp.ac.in">http://ndl.iitkgp.ac.in</a> <a href="http://ocw.mit.edu">http://ocw.mit.edu</a> <a href="http://mathforum.org">http://mathforum.org</a>					

<b>Degree</b>	<b>B.Sc</b>	<b>Branch</b>	<b>MATHEMATICS</b>			
<b>Year</b>	III	Course Name	DSE	Credits	Theory	4
<b>Semester</b>	V	Course Code	MATH 354		Tutorial	1
<b>Paper Name</b>	ORDINARY DIFFERENTIAL EQUATIONS					
<b>UNIT I</b>	Exact differential equations – Equations of the First, but of higher degree – Equations solvable for $dy/dx$ , solvable for $y$ , solvable for $x$ , Clairaut's form					
<b>UNIT II</b>	Linear Differential equations with constant co-efficients - Linear differential equations with variable coefficients.					
<b>UNIT III</b>	Method of Variation of parameters – Simultaneous Linear differential equations with constant coefficients					
<b>UNIT IV</b>	Laplace transform – basic properties – transforms of derivatives and integrals functions – derivatives and integrals of transforms – transforms of step function – and impulse functions – transforms of periodic functions					
<b>UNIT V</b>	Inverse Laplace transforms – convolution theorem – initial and final value theorem – solution of linear ODE of second order with constant coefficients using Laplace transform.					
<b>Prescribed Text(specify sections clearly)</b>	<ol style="list-style-type: none"> <li>1. <i>Calculus III S.Narayanan and T.K. Manicavachagom Pillay , for Units I,II and III</i></li> <li>2. <i>Engineering Mathematics - II by Dr. M.B.K. Moorthy for Unit IV and Unit V</i></li> </ol>					
<b>Reference Books</b>	<ol style="list-style-type: none"> <li>1. <i>Introductory course in Differential equations , D.A.Murray, Orient Longman (1967)</i></li> <li>2. <i>Advance Engineering Mathematics , Erwin Kreyzsig, Wiley India Edition (2010)</i></li> <li>3. <i>Engineering Mathematics , M.K.Venkataraman, National Publications , Chennai (2009)</i></li> <li>4. <i>Boyce and Di Prima, Differential Equations and Boundary Value Problems, Wiley,10<sup>th</sup> edition 2012</i></li> </ol>					
<b>e-Learning Source</b>	<a href="http://ndl.iitkgp.ac.in">http://ndl.iitkgp.ac.in</a> <a href="http://ocw.mit.edu">http://ocw.mit.edu</a> <a href="http://mathforum.org">http://mathforum.org</a>					

<b>Degree</b>	<b>B. Sc</b>	<b>Branch</b>	<b>MATHEMATICS</b>			
<b>Year</b>	III	Course Name	DSE	Credits	Theory	4
<b>Semester</b>	V	Course Code	MATH 355		Tutorial	1
<b>Paper Name</b>	STATICS					
<b>UNIT I</b>	Definition of a Force-Types of Forces: Gravity, Tension, Resistance, Friction-Magnitude and Direction of the Resultant of Forces on a particle - Equilibrium of a Particle.					
<b>UNIT II</b>	Equilibrium of a Particle acted on by Three Forces-The Triangle of forces-Necessary and Sufficient conditions for the Equilibrium of a Particle under Three Forces- Lami's Theorem--Necessary and Sufficient conditions for the Equilibrium of a Particle under a System of Forces-Equilibrium of a Particle on a Rough Inclined Plane.					
<b>UNIT III</b>	Equivalent Systems of Forces-Resultant of Parallel Forces-Couples-Resultant of Several Coplanar Forces-Moment of the Resultant Force -Varignon's Theorem-Couples in a Plane or in Parallel planes- Resultant of a Couple and a Force.					
<b>UNIT IV</b>	Equation of the Line of action of the Resultant-Equilibrium of the Rigid body under three coplanar forces.					
<b>UNIT V</b>	Equilibrium of uniform homogeneous string- Sag-Suspension Bridge.					
<b>Prescribed Text(specify sections clearly)</b>	<i>Mechanics, P. Duraipandian, LaxmiDuraipandian and MuthamizhJayapragasam, S. Chand and Company Ltd, New Delhi (1997) Unit I- Chapter 2; Unit II- Chapter 6; Unit III- Chapter 7 ( up to Section 7.9); Unit IV- Chapter 7(Sections 7.10 to 7.12); Unit V: Chapter 11</i>					
<b>Reference Books</b>	<ol style="list-style-type: none"> <li><i>Mechanics(Statics and Dynamics) by S.G Venkatachalapathy, Margham Publications, Chennai.</i></li> <li><i>Statics, M.K.Venkatraman, Agastiar publications, 12<sup>th</sup> Edition, 2007.</i></li> <li><i>Golden Statics by N.T. Bali – Laxmi Publications.</i></li> </ol>					
<b>e-Learning Source</b>	<a href="http://ndl.iitkgp.ac.in">http://ndl.iitkgp.ac.in</a> <a href="http://ocw.mit.edu">http://ocw.mit.edu</a> <a href="http://mathforum.org">http://mathforum.org</a>					



<b>Degree</b>	<b>B.Sc</b>	<b>Branch</b>	<b>MATHEMATICS</b>			
<b>Year</b>	III	Course Name	DSE	Credits	Theory	4
<b>Semester</b>	V	Course Code	MATH 356		Tutorial	1
<b>Paper Name</b>	<b>MATHEMATICAL STATISTICS - I</b>					
<b>UNIT I</b>	Random variables – Distribution function – Discrete random variable – Continuous random variable – Continuous distribution function – Two dimensional random variables – Joint probability function – Mathematical expectation and variance.					
<b>UNIT II</b>	Moment generating function – Properties of MGF – Cumulants – Properties of Cumulants – Characteristic function – Properties of characteristic function – Tchebychev’s inequality.					
<b>UNIT III</b>	Binomial distribution – Moments of binomial distribution – Recurrence relation for the moments of binomial distribution – MGF of Binomial distribution – Characteristic function of Binomial distribution – Fitting a binomial distribution.					
<b>UNIT IV</b>	Poisson distribution – Moments of the Poisson distribution – Recurrence relation for moments of Poisson distribution – Moment generating function of Poisson distribution – Characteristic function of Poisson distribution – Fitting a Poisson distribution.					
<b>UNIT V</b>	Normal distribution – Properties of normal distribution – Mode, Median, MGF, Moments Points of inflexion, Median deviation about mean, Area property of Normal distribution – Problems using area Properties.					
<b>Prescribed Text(specify sections clearly)</b>	<i>Fundamentals of Mathematical Statistics by S.C.Gupta, V.K.Kapoor, Sultan Chand and Sons , 11<sup>th</sup> edition</i> <i>Unit I : 5.1 to 5.4, 6.1 to 6.9</i> <i>Unit II : 6.10 to 6.13</i> <i>Unit III : 7.2</i> <i>Unit IV : 7.3</i> <i>Unit V : 8.2.1 to 8.2.11</i>					
<b>Reference Books</b>	1. <i>Statistical methods by S.P.Gupta – Sultan Chand.</i> 2. <i>Statistics(Theory and Practice) by R.S.N.Pillai&amp; V. Bagavathy - S.Chand&amp; Co.</i> 3. <i>Robert V. Hogg and Allen T. Craig , Introduction to Mathematical Statistics (Fifth Edition) Pearson Education, 2005</i>					
<b>e-Learning Source</b>	<a href="http://ndl.iitkgp.ac.in">http://ndl.iitkgp.ac.in</a> <a href="http://ocw.mit.edu">http://ocw.mit.edu</a> <a href="http://mathforum.org">http://mathforum.org</a>					

Degree	B.Sc	Branch	MATHEMATICS			
Year	III	Course Name	GE - 1	Credits	Theory	3
Semester	V	Course Code	MATH 357		Tutorial	0
Paper Name	Programming Using SCILAB - Theory (3 Credits)					
UNIT I	<p>Overview of Scilab - How to get started with Scilab - Getting help from Scilab demonstrations and macros – The Console – The Editor – Batch Processing</p> <p>Creating Real Variables - Elementary mathematical functions – Booleans – Complex Numbers – Integers – Floating Points – Strings – Dynamic Variables</p>					
UNIT II	<p>Matrices – Create Matrices of Real Variables – Accessing Elements of Matrices - Matrices are dynamic – Elementwise Operations</p> <p>Conjugate transpose and non-conjugate transpose - Multiplication of two vectors</p> <p>Comparing two real matrices - Issues with floating point integers - More on elementary functions - Higher-level linear algebra features</p>					
UNIT III	<p>Looping and branching - The if , select , for and while statements</p> <p>The break and continue statements</p> <p>Functions - Function libraries - Managing output arguments</p> <p>Levels in the call stack - The return statement - Debugging functions with pause</p>					
UNIT IV	<p>Plotting - 2D plot - Contour plots - Titles, axes and legends - Export</p>					
UNIT V	<p>Solving Ordinary Differential Equations using Scilab</p>					
<b>Prescribed Text(specify sections clearly)</b>	<ol style="list-style-type: none"> <li>1. <i>Introduction to Scilab - Michael Baudin From Scilab Consortium, 2010 Chapters 1 to 8 (Book Freely Downloadable in Internet)</i></li> <li>2. <i>Plotting Using Scilab – An open Source Document – <a href="http://www.openeering.com">www.openeering.com</a></i></li> </ol>					
<b>Reference Books</b>	<ol style="list-style-type: none"> <li>1. <i>Modeling and Simulation in Scilab, Stephen L. Campbell, Jean-Philippe Chancelier and Ramine Nikoukhah</i></li> <li>2. <i>An Introduction to Scilab from a Matlab User's Point of View by Eike Rietsch</i></li> </ol>					
<b>e-Learning Source</b>	<p><a href="http://ndl.iitkgp.ac.in">http://ndl.iitkgp.ac.in</a></p> <p><a href="http://ocw.mit.edu">http://ocw.mit.edu</a></p> <p><a href="http://mathforum.org">http://mathforum.org</a></p>					

<b>Degree</b>	<b>B.Sc</b>	<b>Branch</b>	<b>MATHEMATICS</b>			
<b>Year</b>	III	Course Name	SEC - 4	Credits	Theory	2
<b>Semester</b>	VI	Course Code	MATH 361		Tutorial	0
<b>Paper Name</b>	<b>PROGRAMMING LAB IN NUMERICAL METHODS - PRACTICALS</b>					
<p>LIST OF PRACTICALS</p> <ol style="list-style-type: none"> <li>1. Write a program to solve algebraic and transcendental equations by Bisection method</li> <li>2. Write a program to solve algebraic equation and transcendental by Newton-Raphson method</li> <li>3. Write a program to solve simultaneous linear algebraic equations by Gauss jordan method</li> <li>4. Write a program to find the inverse of a matrix of order n</li> <li>5. Write a program to find the determinant of a matrix of order n</li> <li>6. Write a program to solve simultaneous linear algebraic equations by Gauss Seidal</li> <li>7. Write a program to evaluate definite integral by Trapezoidal rule</li> <li>8. Write a program to evaluate definite integral by Simpson's 1/3 rule</li> <li>9. Write a program to solve first order ODE by Euler's method</li> <li>10. Write a program to solve the first order ODE by Runge Kutta method</li> </ol> <p><b>Text Book:</b> Handmade Lab Manualfor Programming Lab</p>						
<b>e-Learning Source</b>	<a href="http://ndl.iitkgp.ac.in">http://ndl.iitkgp.ac.in</a> <a href="http://ocw.mit.edu">http://ocw.mit.edu</a> <a href="http://mathforum.org">http://mathforum.org</a>					

Degree	B.Sc	Branch	MATHEMATICS			
Year	III	Course Name	DSE	Credits	Theory	4
Semester	VI	Course Code	MATH 362		Tutorial	1
Paper Name	COMPLEX ANALYSIS- II					
UNIT I	Contour integrals- - Examples - The Cauchy Goursat's theorem - A preliminary lemma - Proof of Cauchy Goursat's theorem - Simply and multiple connected domains.					
UNIT II	The Cauchy integral formula -Derivatives of analytic functions - Morera's theorem - Maximum moduli of functions-Liouville's theorem- The fundamental theorem of algebra.					
UNIT III	Convergence of sequences and series - Taylor series - Observations and examples – Laurent Series (statement only).					
UNIT IV	Singularities - Definitions and examples - Residues - The residue theorem - The principal part of a function - Residues and poles – zeros and poles of order m.					
UNIT V	Type 1 : $\int_{-\infty}^{\infty} \frac{p(x)}{q(x)} dx$ Type 2 : $\int_{-\infty}^{\infty} \frac{p(x)}{q(x)} \sin ax \, dx$ or $\int_{-\infty}^{\infty} \frac{p(x)}{q(x)} \cos ax \, dx$ Type 3 : $\int_0^{2\pi} F(\sin \theta, \cos \theta) d\theta$ where p(x) and q(x) are real polynomials with no factor in common and q(x) has no real zeros.					
<b>Prescribed Text(specify sections clearly)</b>	<i>Complex Variables and Applications, James Ward Brown and Ruel V Churchill, McGraw - Hill, International Edition (1990)</i> Unit I : Chapter 4:Section 34-38 Unit II: Chapter 4 Section 39-43 Unit III:Chapter 5:Section 44-48 Unit IV:Chapter 6:Section 53-57 Unit V:Chapter 6:Section 58-60					
<b>Reference Books</b>	<ol style="list-style-type: none"> <li>1. <i>Functions of a Complex variable by B. S. Tyagi – KedarNath Ram NathPublishers(P) Ltd.</i></li> <li>2. <i>Complex Analysis by P. Duraipandian and KayalalPachaiappa – S.Chand &amp; Co.</i></li> <li>3. <i>S. Ponnusamy, Foundations of Complex analysis, (2<sup>nd</sup> Edition), Narosa, 2011.</i></li> <li>4. <i>V.Karunakaran, Complex Analysis, (2<sup>nd</sup> Edition), Narosa 2005</i></li> </ol>					
<b>e-Learning Source</b>	<a href="http://ndl.iitkgp.ac.in">http://ndl.iitkgp.ac.in</a> <a href="http://ocw.mit.edu">http://ocw.mit.edu</a> <a href="http://mathforum.org">http://mathforum.org</a>					

<b>Degree</b>	<b>B.Sc</b>	<b>Branch</b>	<b>MATHEMATICS</b>			
<b>Year</b>	III	Course Name	DSE	Credits	Theory	4
<b>Semester</b>	VI	Course Code	MATH 363		Tutorial	1
<b>Paper Name</b>	<b>OPERATIONS RESEARCH - II</b>					
<b>UNIT I</b>	Network and Basic Components – Logical sequence – Rules for Network Construction – Critical Path Analysis – Probability Considerations in PERT – Difference between PERT and CPM					
<b>UNIT II</b>	Deterministic inventory Models <ol style="list-style-type: none"> <li>1. Uniform rate of demand infinite rate of production, no shortage</li> <li>2. Uniform rate of demand, Finite rate of replenishment , no shortages</li> <li>3. Uniform rate of demand, instantaneous Production with shortages</li> <li>4. Uniform rate of demand, instantaneous Production with shortages and fixed time</li> </ol>					
<b>UNIT III</b>	Queueing Systems – Elements of Queueing systems – Characteristics of queueing Systems – Distribution of Arrivals – Distribution of Inter arrival time – Classification of queueing Models – Deriving Steady state Probabilities for M/M/1 queueing systems - System Measures - Little formula - Deriving Steady state Probabilities for M/M/1 queueing systems with finite capacity - System Measures – Related Problems.					
<b>UNIT IV</b>	Multi server queueing Model - Deriving Steady state Probabilities for M/M/c queueing system - System Measures – Deriving Steady state Probabilities for M/M/c queueing system with finite capacity - System Measures – Related Problems.					
<b>UNIT V</b>	Methodology of Simulation – Event type simulation – Generation of random numbers – Monte – Carlo Simulation on Inventory Problems - simulation of Queueing Systems.					
<b>Prescribed Text(specify sections clearly)</b>	<i>Operations Research by KantiSwarup , P.K.Gupta and Man Mohan (2006)</i> <i>Unit 1: Chapter 21: Sections 21.1 – 21.7</i> <i>Unit 2: Chapter 19 : Sections 19.1 – 19.7</i> <i>Unit3: Chapter 20: Sections 20.1 – 20.8</i> <i>Unit 4: Chapter 20: Sections 20.8</i> <i>Unit 5: Chapter 23: Sections 23.1 – 23.9</i>					
<b>Reference Books</b>	<ol style="list-style-type: none"> <li>1. <i>Resource Management Techniques(Operations Research) by V. Sundaresan, K. S. Ganapathy Subramanian, K. Ganesan – A. R. Publications</i></li> <li>2. <i>Operations Research: An Introduction, 9<sup>th</sup> edition, Hamdy A.Taha, Pearson, 2010</i></li> </ol>					
<b>e-Learning Source</b>	<a href="http://ndl.iitkgp.ac.in">http://ndl.iitkgp.ac.in</a> <a href="http://ocw.mit.edu">http://ocw.mit.edu</a> <a href="http://mathforum.org">http://mathforum.org</a>					

<b>Degree</b>	<b>B.Sc</b>	<b>Branch</b>	<b>MATHEMATICS</b>			
<b>Year</b>	III	Course Name	DSE	Credits	Theory	4
<b>Semester</b>	VI	Course Code	MATH 364		Tutorial	1
<b>Paper Name</b>	PARTIAL DIFFERENTIAL EQUATIONS					
<b>UNIT I</b>	Formation of Partial differential equations – by elimination of arbitrary constants – by elimination of arbitrary functions – Singular integral – General integral.					
<b>UNIT II</b>	Standard types of first order equations – Standard 1,2,3,4 - Equations reducible to standard forms.					
<b>UNIT III</b>	Lagrange’s equations - Charpit’s Method.					
<b>UNIT IV</b>	Linear Partial Differential equation of Second and higher order with constant coefficients.					
<b>UNIT V</b>	One dimensional wave equations, heat equation, Laplace equation – Simple problems.					
<b>Prescribed Text(specify sections clearly)</b>	<i>S.Narayanan and T.K. Manicavachagom Pillay , Calculus III</i> <i>Unit 1, 2, 3 : Chapter 4</i>  <i>Transforms and Partial differential equations by Dr. A. Singaravelu</i> <i>Unit 4 : Chapter 3</i> <i>Unit 5 : Chapter 4</i>					
<b>Reference Books</b>	1. <i>Introductory course in Differential equations , D.A.Murray, Orient Longman (1967)</i> 2. <i>Advance Engineering Mathematics , Erwin Kreyzsig, Wiley India Edition (2010)</i> 3. <i>Engineering Mathematics , M.K.Venkataraman, National Publications , Chennai (2009)</i>					
<b>e-Learning Source</b>	<a href="http://ndl.iitkgp.ac.in">http://ndl.iitkgp.ac.in</a> <a href="http://ocw.mit.edu">http://ocw.mit.edu</a> <a href="http://mathforum.org">http://mathforum.org</a>					

Degree	B.Sc.	Branch	MATHEMATICS			
Year	III	Course Name	DSE	Credits	Theory	4
Semester	VI	Course Code	MATH 365		Tutorial	1
Paper Name	<b>DYNAMICS</b>					
UNIT I	Velocity- Relative Velocity- Acceleration- Angular Velocity- Relative Angular Velocity- Rectilinear Motion- Work, Power and Energy.					
UNIT II	Central Forces and Central Orbit- Equations of a Central Orbit- Law of Force and Speed for a given Orbit- Determination of the orbit when the law of force is given- Kepler's laws of Planetary motion.					
UNIT III	Motion of a Projectile- Nature of a Trajectory- Results Pertaining to the motion of a Projectile- Maximum Horizontal Range- Trajectories with a given speed of projection and a given horizontal range- Speed of a Projectile- Range on an Inclined plane- Maximum range on the inclined plane- Envelope of the trajectories.					
UNIT IV	Definition of Simple Harmonic Motion- Composition of two Simple Harmonic Motions of the same period. Moment of Inertia-Theorems of moment of Inertia – Theorem of Perpendicular axes- Theorem of parallel axes.					
UNIT V	Two Dimensional Motion of a Rigid Body- Motion of a Rigid Body rotating about a fixed axis- Compound Pendulum- Reaction of the axis on a rigid Body revolving about a fixed axis- Equations of Motion for a two dimensional Motion- Motion of a uniform disk rolling down an inclined plane.					
Prescribed Text(specify sections clearly)	<i>Mechanics, P. Duraipandian, LaxmiDuraipandian and MuthamizhJayapragasam, S. Chand and Company Ltd, New Delhi (1997)</i> Unit I-Chapter 1 and 4; Unit II- Chapter 15; ;Unit III-- Chapter 13(up to Section 13.9); Unit IV-Chapter 5(Section 5.1 and 5.3 only) and Chapter 16; Unit V-Chapter 17					
Reference Books	1. <i>Mechanics(Statics and Dynamics) by S.G Venkatachalapathy, Margham Publications, Chennai.</i> 2. <i>Dynamics,, M.K.Venkatraman, Agastiar publications, 12<sup>th</sup> Edition, 2007.</i> 3. <i>Golden Statics by N.T. Bali – Laxmi Publications.</i>					
e-Learning Source	<a href="http://ndl.iitkgp.ac.in">http://ndl.iitkgp.ac.in</a> <a href="http://ocw.mit.edu">http://ocw.mit.edu</a> <a href="http://mathforum.org">http://mathforum.org</a>					

<b>Degree</b>	<b>B.Sc</b>	<b>Branch</b>	<b>MATHEMATICS</b>			
<b>Year</b>	III	Course Name	DSE	Credits	Theory	4
<b>Semester</b>	VI	Course Code	MATH 366		Tutorial	1
<b>Paper Name</b>	<b>MATHEMATICAL STATISTICS - II</b>					
<b>UNIT I</b>	Correlation – Properties - Rank Correlation – Bivariate correlation					
<b>UNIT II</b>	Regression – Properties – Regression equations					
<b>UNIT III</b>	Sampling – Types of sampling – Parameter and statistics – Test of significance – Null hypothesis – Alternate hypothesis – Procedures in testing of hypothesis – errors in sampling critical region – level of significance					
<b>UNIT IV</b>	Test of significance of large sampling – Test of significance of single mean – Test of significance of difference between two means – test of significance of proportion – test of significance of difference between two proportions – test of significance of difference between two standard deviation					
<b>UNIT V</b>	Chi square test (definition) – chi square test for test of goodness of fit – independence of attributes – student’s t – distribution (definition) – t-test for single mean – t- test for difference between two means – t–test for dependent sample – t-test for co-efficient of correlation					
<b>Prescribed Text(specify sections clearly)</b>	<i>Fundamentals of Mathematical Statistics by S.C.Gupta, V.K.Kapoor, Sultan Chand and Sons , 11<sup>th</sup> edition</i> Unit I : 10.1 to 10.6 Unit II : 10.7 Unit III : 12.1 to 12.7 Unit IV : 12.8 – 12.15 Unit V : 13.1, 13.7, 14.1, 14.2					
<b>Reference Books</b>	1. <i>Statistical methods by S.P.Gupta – Sultan Chand.</i> 2. <i>Statistics(Theory and Practice) by R.S.N.Pillai&amp; V. Bagavathy - S.Chand&amp; Co.</i> 3. <i>Robert V. Hogg and Allen T. Craig , Introduction to Mathematical Statistics (Fifth Edition) Pearson Education, 2005</i>					
<b>e-Learning Source</b>	<a href="http://ndl.iitkgp.ac.in">http://ndl.iitkgp.ac.in</a> <a href="http://ocw.mit.edu">http://ocw.mit.edu</a> <a href="http://mathforum.org">http://mathforum.org</a>					



<b>Degree</b>	<b>B.Sc</b>	<b>Branch</b>	<b>MATHEMATICS</b>			
<b>Year</b>	III	Course Name	GE - 2	Credits	Theory	3
<b>Semester</b>	VI	Course Code	MATH 367		Tutorial	0
<b>Paper Name</b>	<b>NUMERICAL METHODS</b>					
<b>UNIT I</b>	Numerical solution of algebraic and transcendental equations – Bolzano’s bisection method - Successive approximation method – Regula falsi method – Newton-Raphson method.					
<b>UNIT II</b>	Numerical solution of simultaneous linear algebraic equations – Gauss elimination method - Gauss Jordan elimination method – Gauss Seidel iteration method.					
<b>UNIT III</b>	Finite difference operator - Interpolation – Newton-Gregory forward and backward interpolation – Newton’s divided difference formula – Lagrange’s interpolation formula for uneven intervals – Gauss interpolation formula – Numerical differentiation – Numerical Integration – Trapezoidal rule – Simpson’s 1/3 <sup>rd</sup> rule.					
<b>UNIT IV</b>	Numerical solutions of Ordinary differential equations of first and second order – Simultaneous equations – Taylor series method – Picard’s method.					
<b>UNIT V</b>	Euler’s method – Improved Euler’s Method - Modified Euler’s Method – Runge-Kutta method of second and fourth order – Milne’s predictor corrector method.					
<b>Prescribed Text(specify sections clearly)</b>	<i>Numerical Method in Science and Engineering, M.K.Venkataraman, National Publication Co, Chennai(2001)</i> Unit 1: Chapter 3 and 4 Unit 2: Chapter 5 Unit 3: Chapter 6 and 9 Unit 4: Chapter 11 (Relevant portions) Unit 5: Chapter 11 (Relevant portions)					
<b>Reference Books</b>	<i>Computer oriented Numerical Methods by V. Rajaram – PHI(P) Ltd.</i>					
<b>e-Learning Source</b>	<a href="http://ndl.iitkgp.ac.in">http://ndl.iitkgp.ac.in</a> <a href="http://ocw.mit.edu">http://ocw.mit.edu</a> <a href="http://mathforum.org">http://mathforum.org</a>					

## QUESTION PAPER PATTERN

Total Mark :75

Time :3 Hours

Section A	Section B	Section C
<p style="text-align: center;"><b><u>Ten questions</u></b> <b><u>10*2 = 20</u></b></p> <p><b>Two questions from each units</b></p>	<p style="text-align: center;"><b><u>Five Questions</u></b> <b><u>5*5 = 25</u></b></p> <p>Internal choice one set of questions from each units</p>	<p style="text-align: center;"><b><u>Three Questions</u></b> <b><u>3*10 = 30</u></b></p> <p>3 out of 5 questions (one question from each unit)</p>

Section	No. of Questions	Allocation of questions	Choice type	Mark per Question	Total Marks
<b>A</b>	10	Two from each unit	No choice	2	10X2=20
<b>B</b>	5	One set from each unit	Either or type	5	5X5=25
<b>C</b>	5	One from each unit	3 out of 5	10	3X10=30