

Bachelor of Honours
ACADEMIC CALENDAR
&
COURSE PLAN

2014 - 2015



Department of Mathematics
Government City College, Rajshahi

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Rbre Gm.Gg Avej Kvj vg AvRv`	mnKvi x Aa`vcK	01717-415058 pgdmbamilton@gmail.com	
Rbre tgyt Zm`j Bmj vg	c`fvl K	01717-308728 www.tohidaihai@yahoo.com	
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2008	2	15	5	2	0	1	25

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(100 bŕŕi i ŕKvmŕ 60 Kvm NbUv = 4 ŕmWU,

75 bŕŕi i ŕKvmŕ 45 Kvm NbUv = 3 ŕmWU,

50 bŕŕi i ŕKvmŕ 30 Kvm NbUv = 2 ŕmWU)

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- 7| QvI-QvI`x` i c`Z`K cixvi cte`teZb Ab`vb` wd nvj bvlv` cwitkva Kti c`ekcI msMh KitZ nte|
- 8| tKvb QvI-QvI`x` i Ktj tRi k;Ljv cwic`sk tKvb KvR Kitj KZEy eun`vimn AvBbvM th tKvb kw`bj K e`e`v wbtZ cvi`teb|
- 9| GB c`Zov`bi wbggk;Ljv eRvq ivL`tZ Ges metP`tq fij djvdj KitZ mKj QvI-QvI`xi c`Pov I AwffveKef` i mn`thvMZv Avgr` i Kv`|
- 10| agRq Ab`povw` P`v``tvtmi I ci wfpkxj nI qvq Duj o`wLZ QvI Zwi L cwiewZ`Z n`tZ cvi |
- 11| c`QvRtb th tKvb KvhPg KZEy cwieZB KitZ cvi |

Course Plan

Honours

1st Year

2nd Year

3rd Year

4th Year

Session : 2014-2015



Department of Mathematics
Rajshahi Govt. City College, Rajshahi.

Department of Mathematics
Rajshahi Govt. City College, Rajshahi

1st Year Honours (2014-15)

Courses and Marks Distribution
Year wise Papers and marks distribution

FIRST YEAR

Paper Code	Paper Title	Marks	Credits
213701	Fundamentals of Mathematics	75	3
213703	Calculus – I	75	3
213705	Linear Algebra	75	3
213707	Analytic and Vector Geometry	75	3
Any TWO of the following:			
212807	Chemistry-I	100	4
212808	Chemistry-I Practical	50	2
213607	Introduction to Statistics	100	4
213608	Statistics Practical-I	50	2
212707	Physics-I (Mechanics, Properties of Matter, Waves & Optics)	100	4
212709	Physics-II (Heat, Thermodynamics and Radiation)	50	2
211501	History of the Emergence of Independent Bangladesh	100	4
	Total =	700	28

Department of Mathematics

Rajshahi Govt. City College, Rajshahi

Course Plan

1st Year Honours (2014-15)

Paper Code: 213701

Paper Title: **Fundamentals of Mathematics**

Marks-75, 3(credits), 45 Lectures

Examination	Course Content	Lectures
1st Incourse (20 Lectures)	Elements of logic: Mathematical statements, Logical connectives, Conditional and bi-conditional statements, Truth tables and tautologies, Quantifiers, Logical implication and equivalence, Deductive reasoning.	5
	Set Theory : Sets and subsets, Set operations, Cartesian product of two sets, Operations on family of sets, De Morgan's laws.	4
	Relations and functions: Relations. Order relation. Equivalence relations. Functions. Images and inverse images of sets. Injective, surjective, and bijective functions. Inverse functions.	4
	Real Number System: Field and order properties, Natural numbers, Integers and rational numbers, Absolute value and their properties,	3
	Basic inequalities. (Including inequalities of means, powers; inequalities of Cauchy, Chebyshev, Weierstrass).	4
2nd Incourse (20 Lectures)	Complex Number System: Field of Complex numbers, De Moivre's theorem and its applications.	5
	Theory of equations: Relations between roots and coefficients, Symmetric functions of roots, Sum of the powers of roots, Synthetic' division, Des Cartes rule of signs, Multiplicity of roots, Transformation of equations.	6
	Elementary number theory: Divisibility. Fundamental theorem of arithmetic. Congruences (basic properties only).	4
	Summation of series: Summation of algebraic and trigonometric series.	5
Test (5 Lectures)	Revision and Discussion	5

Books Recommended:

1. Schaums Outline Series- Theory and problems on set theory and related topics.
2. S. Bernard & J M Child- Higher algebra.
3. Md. Abdur Rahman - Basic Algebra.

1st Year Honours (2014-15)

Paper Code: 213703

Paper Title: **Calculus-I**

Marks-75, 3(credits), 45 Lectures

Examination	Course Content	Lectures
1st Incourse (20 Lectures)	Functions & their graphs : Polynomial and rational functions, logarithmic and exponential functions, trigonometric functions & their inverses, hyperbolic functions & their inverses, combinations of such functions.	4
	Limit and continuity: Definitions and basic theorems on limit and continuity. Limit at infinity & infinite limits, Computation of limits.	4
	Differentiation: Tangent lines and rates of change. Definition of derivative. One-sided derivatives. Rules of differentiation (proofs and applications). Successive differentiation. Leibnitz's theorem (proof and application). Related rates. Linear approximations and differentials.	4
	Applications of Differentiation: Mean value theorem. Maximum and minimum values of functions. Concavity and points of inflection. Optimization problems.	4
	Approximation and Series: Taylor polynomials and series. Convergence of series. Taylor's series. Taylor's theorem and remainders. Differentiation and integration of series. Validity of Taylor expansions and computations with series.	4
2nd Incourse (20 Lectures)	Integration: Antiderivatives and indefinite integrals. Techniques of integration. Definite integration using antiderivatives. Fundamental theorems of calculus (proofs and applications). Basic properties of integration. Integration by reduction.	6
	Applications of Integration: Arc length. Plane areas. Surfaces of revolution. Volumes of solids of revolution. Volumes by cylindrical shells. Volumes by cross sections.	4
	Graphing in polar coordinates: Tangents to polar curves. Arc length in polar coordinates. Areas in polar coordinates.	6
	Improper integrals : Tests of convergence and their applications. Gamma and Beta functions. Indeterminate form of type 0/0. L'Hospital's rule. Other indeterminate forms.	4
Test (5 Lectures)	Revision and Discussion	5

Books Recommended:

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| 1. Howard Anton | : Calculus (7 th and forward editions). |
| 2. E.W. Swokowski | : Calculus with Analytic Geometry. |
| 3. Md. A Matin & B Chakraborty | : Differential Calculus |
| 4. Md Abu Yousuf | : Differential and Integral Calculus |

1st Year Honours (2014-15)

Paper Code: 213705

Paper Title: **Linear Algebra**

Marks-75, 3(credits), 45 Lectures

Examination	Course Content	Lectures
1st Incourse (20 Lectures)	Matrices: Notion of matrix. Types of matrices. Algebra of matrices, Some theorems, Determinants: Introduction, Determinant function. Properties of determinants. Minors, Cofactors, expansion and evaluation of determinants. Elementary row and column operations and row-reduced echelon matrices. Invertible matrices: Invertible matrices. Different types of matrices, Rank of matrices.	7
	Vectors in \mathbb{R}^n and \mathbb{C}^n: Vectors in \mathbb{R}^2 , Vectors in \mathbb{R}^3 , Vectors in \mathbb{R}^n , addition of two vectors in \mathbb{R}^2 and \mathbb{R}^n , zero vector, Dot or innerproduct in \mathbb{R}^3 & \mathbb{R}^n , parallel vectors, perpendicular vectors, Distance between two vectors, Norm or length in \mathbb{R}^3 & \mathbb{R}^n , vectors in \mathbb{C}^n , Dot product in \mathbb{C}^n , norm in \mathbb{C}^n , Cauchy-Schwarz inequality, Minkowski's inequality.	7
	A System of Linear Equations: A homogeneous and non-homogeneous system to linear equations, particular solution and general solution, zero or trivial solution, non trivial and trivial solution, consistent and inconsistent system of Linear equation, Echelon form, Gaussian elimination, Matrix form of system of linear equation, Matrix form of system of linear equation. Solved problem	6
2nd Incourse (20 Lectures)	Application of matrices and determinants for solving system of linear equations: Solution of system of linear equations by the matrix method, Cramer's rule, Applications of system of equations in real life problems.	4
	Vector Spaces: Binary operation, Group, Ring, Field, vector space, sub space, sum and direct sum, solved problem. Linear combination: Linear combination, dependence and independence, Linear dependence and independence of vector, Solved problem. Generators, Basis, Dimension: Generator, Basis and dimension of vectors, Basis and dimension of solution space, Row space and column space of a matrix, Basis and dimension of Row and column space of matrix, Solved problem.	8
	Linear Transformation: Linear transformation and linear operation, Image and Kernel of linear transformation. Rank and Nullity, singular and non singular linear transformation, Matrix and linear transformations. Relation between rank and nullity, composition function of linear transformation, Solved problem. Matrix representation of linear transformation: Matrix representation of linear transformation of a linear operator, Change of basis matrix, Transition matrix, Solved problem.	8
Test (5 Lectures)	Eigen values and Eigen vectors: Matrix polynomial, Eigen values and Eigen vectors of a linear operator, Eigen vector of a square matrix, Characteristic matrix, polynomial and equation, The minimum polynomial, similar matrix, Eigen space. Solved problem. Revision and Discussion	5

Books Recommended:

1. Howard Anton & Chris Rorres – Elementary Linear Algebra with Application.
2. Seymour Lipschutz (Schaum's Outline Series)-Linear Algebra.
3. Md. Abdur Rahman- Linear Algebra.

1st Year Honours (2014-15)

Paper Code: 213707

Paper Title: **Analytic and vector Geometry**

Marks-75, 3(credits), 45 Lectures

Examination	Course Content	Lectures
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1st Incourse (20 Lectures)	Two-dimensional Geometry: Transformation of coordinates, Pair of straight lines (Homogeneous second degree equations, General second degree equations represent a pair of straight lines, Angle between pair of straight lines, Bisectors of angle between pair of straight lines),	12
	Two-dimensional Geometry: General equations of second degree (Reduction to standard forms, Identifications, Properties and Tracing of conics).	8
2nd Incourse (20 Lectures)	Three-dimensional Geometry: Three-dimensional coordinates, Distance, Direction cosines and direction ratios, Planes and straight lines, Spheres. Conicoids (basic properties).	12
	Vector Geometry: Vectors in plane and space, Algebra of vectors, Scalar and vector product, Vector equations of straight lines and planes. Triple scalar product. Applications of vectors to geometry (vector equations of straight lines and planes, areas and volumes).	8
Test (5 Lectures)	Revision and Discussion	5

Books Recommended:

1. H.H. Askwith : Analytic Geometry of Conic Section.
2. J. A. Hummel : Vector Geometry.
3. Khosh Mohammad : Analytic Geometry and Vector Analysis.
4. Rahman & Bhattacharjee : A text Book on Co-ordinate Geometry With Vector Analysis
5. Robert J.T. Bell : A treatise on Three Dimensional Geometry

1st Year Honours (2014-15)

Course Code: 211501

Course Name: **History of Emergence of Independent Bangladesh**

Marks-100, 4(credits), 60 Lectures

Course Code		Marks: 100	Credits: 4	Class Hours: 60
Course Title:	History of Emergence of Independent Bangladesh			

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- L) bZwEjK MVb
- M) fvlv
- N) ms`vZi mgšqew`Zv l agfQ mnbkxj Zv
- O) Avfbævsj vi cwi t`c`f`Z ZrKvj xb ce`% l eZgvb evsj v`tki `Kxq mEv

2) ALÜ `vaxb evsj v ivóMVtbi cõm l Dcgnv`tki vefw³, 1947

- K) Jcwbtekk kymb Avgtj mvc`c`v`vqKZvi D`e l ve`vi
- L) j v`tvi cFve, 1940
- M) ALÜ `vaxb evsj v ivóMVtbi D`v`vM, 1947 l cwi YvZ
- N) cwk`vb mjb, 1947

3) cwk`vb: ivóq Kwvgtv l `elg`

- K) tK`iq l c`t`vkK Kvvtgv
- L) mvgvi K l temvgvi K Avgj vZtšj cFve
- M) A`v`vZK, mvgviRK l mvs`vZK `elg`

4) fvlv Avf`vj b l evOvj i AvZ`cwiPq cõZõv

- K) gmvj g j xMi kymb l MYZvšK ivRbvZi msMõg
- L) Avl qvx j xMi cõZõv, 1949
- M) fvlv Avf`vj b: cUfvg l Nubv c`vn
- N) nK-fvmvb-tmvi vl qv`f hy³ dxU, 1954 mv`tj i vbePb l cwi YvZ

5) mvgvi K kymb: AvBqj Lub l Bqvnqv Lv`tbi kmbvgj (1958-71)

- K) mvgvi K kymbi msAv l `eukó`
- L) AvBqj Lv`tbi fvgZv`Lj l kymbi `eukó` (ivR`v`vZK vbcxob, tgvj K MYZšj atg` ivR`v`vZK e`envi)
- M) AvBqj Lv`tbi cZb l Bqvnqv Lv`tbi kymb, GK BDvBU vej v`vKiY, mveRvxb ffvUvaKvi, Gj Gdl (Legal Framework Order)

6) RvZvqvZv` i vEKv l `vavvi Avf`vj b

- K) mvs`vZK AvMv`tbi vei`tx cõZtva l evOvj ms`vZi D`v`xeb
- L) tkL gvRej i ngv`tbi 6-`dv Avf`vj b
- M) 6-`dv Avf`vj tbi cõZv`vqv, `i`Zi l Zvrch`
- N) AvMi Zjv gv`vj v, 1968

7) 1969-Gi MYAfj`v l 11-`dv Avf`vj b

- K) cUfvg
- L) Avf`vj tbi Kg`v`v, `i`Zi l cwi YvZ

8) 1970 Gi vbePb, Amnt`vM Avf`vj b l e`v`v`v `vaxbZv tNvI Yv

3. Pakistan: Structure of the state and disparity.

- a. Central and provincial structure.
- b. Influence of Military and Civil bureaucracy.
- c. Economic, social and cultural disparity

4. Language Movement and quest for Bengali identity

- a. Misrule by Muslim League and Struggle for democratic politics.
- b. The Language Movement: context and phases.
- c. United front of Haque – Vasani – Suhrawardi: election of 1954, consequences.

5. Military rule: the regimes of Ayub Khan and Yahia Khan (1958-1971)

- a. Definition of military rules and its characteristics.
- b. Ayub Khan's rise to power and characteristics of his rule (Political repression, Basic democracy, Islamisation)
- c. Fall of Ayub Khan and Yahia Khan's rule (Abolition of one unit, universal suffrage, the Legal Framework Order)

6. Rise of nationalism and the Movement for self determination.

- a. Resistance against cultural aggression and resurgence of Bengali culture.
- b. Sheikh Mujibur Rahman and the six point movement
- c. Reactions : Importance and significance
- d. The Agortola Case 1968.

7. The mass- upsurge of 1969 and 11 point movement: background, programme and significance.

8. Election of 1970 and the Declaration of Independence by Bangobondhu

- a. Election result and centres refusal to comply
- b. The non co-operation movement, the 7th March, Address, Operation Searchlight
- c. Declaration of Independence by Bangobondhu and his arrest

9. The war of Liberation 1971

- a. Genocide, repression of women, refugees
- b. Formation of Bangladesh government and proclamation of Independence
- c. The spontaneous early resistance and subsequent organized resistance (Mukti Fouz, Mukti Bahini, guerillas and the frontal warfare)

- d. Publicity Campaign in the war of Liberation (Shadhin Bangla Betar Kendra, the Campaigns abroad and formation of public opinion)
- e. Contribution of students, women and the masses (Peoples war)
- f. The role of super powers and the Muslim states in the Liberation war.
- g. The Anti-liberation activities of the occupation army, the Peace Committee, Al-Badar, Al-Shams, Rajakars, pro Pakistan political parties and Pakistani Collaborators , killing of the intellectuals.
- h. Trial of Bangabondhu and reaction of the World Community.
- i. The contribution of India in the Liberation War
- j. Formation of joint command and the Victory
- k. The overall contribution of Bangabondhu in the Independence struggle.

10. The Bangabondhu Regime 1972-1975

- a. Homecoming
- b. Making of the constitution
- c. Reconstruction of the war ravaged country
- d. The murder of Bangabondhu and his family and the ideological turn-around.

mnvqK MŠ'

1. bxnvi i Äb ivq, *evOvj xi BwZnm*, t`õ R cvejij wks, Kj KvZv 1402 mvj |
2. mvj vn& Dwi b Avntg` I Ab`vb` (m`úw` Z), *evsj vt`tki gvr³ mšMšgi BwZnm 1947-1971*, AvMvgx cKvkbx, XvKv 2002 |
3. wni vRj Bmj vg (m`úw` Z), *evsj vt`tki BwZnm 1704-1971*, 3 LÜ, GwkqnlUK tmmvBilU Ae evsj vt`k, XvKv 1992 |
4. W. nvi`b-Ai-iwk`, *evsj vt`k: ivRbwZ, miKvi I kvmbZmšK Dbqpb 1757-2000*, wD GR cvejij tKkY, XvKv 2001 |
5. W. nvi`b-Ai-iwk`, *evOvj i ivóPŠv I faxb evsj vt`tki Af`q*, AvMvgx cKvkbx, XvKv 2003 |
6. W. nvi`b-Ai-iwk`, *ežeÚi Amgviß AvZ#Rrebx cpcvP*, w` BDwb fvmwD tčñ vj wgtUW, XvKv 2013 |
7. W. AvZdj nvB wkejx I W.tgvt gvepēi ingvb, *evsj vt`tki mšweambK BwZnm 1773-1972*, meY© cKvkb, XvKv 2013 |
8. gbZwmi gvgb I RqšKgv i vq, *evsj vt`tki wmfj mgvR cšZóvi mšMšg*, Aemi, XvKv 2006 |
9. AvwZDi ingvb, *Amn#hVM Avf`vj tbi w`b_vj : gvr³h#xi cšwZ ce,mwvZ` cKik*, XvKv 1998 |
10. W. tgvt gvepēi ingvb, *evsj vt`tki BwZnm, 1905-47*, Zvgij w, XvKv 2011 |
11. W. tgvt gvepēi ingvb, *evsj vt`tki BwZnm, 1947-1971*, mgq cKvkb, XvKv 2012 |

1st Year Honours (2014-15)

Course Code: 213607

Course Name: **Introduction of Statistics**

Marks-100, 4(credits), 60 Lectures

Examination	Course Content	Lectures
1st Incourse (25 Lectures)	Statistics: Its nature and some important uses. Qualitative and quantitative data, classification, graphical representation of data.	6
	Measures of Location, Measures of dispersion, skewness and kurtosis	10
	Correlation coefficient, correlation analysis, The purpose and uses of regression analysis, Simple regression, method of least squares and estimation and parameters correlation ratio. Rank, Correlation, Partial and multiple correlations.	6
	Elements of time series analysis, Measurement of trend by moving average, By least square method. Trend, Curve, Determination of seasonal indices.	3
2nd Incourse (25 Lectures)	Meaning of probability, Definitions of probability, event, sample space and simple problem of probability. Additional rule, Conditional probability, Multiplication rule and Bayes theorem.	6
	The concept of random variable, Probability function and probability density function, joint probability function, Expected value and related theorem, Moment generating function, common probability distributions, Binomial, Poisson and normal.	13
	Concept of an index number and problems in the construction of index number, Type of index and their uses, test for index number.	3
	Differences of a polynomial, Finite difference operator, Difference table, Newton's formula and starling's central difference formula, Inverse interpolation, Numerical Integration.	3
Test (10 Lectures)	Revision	10

Books Recommended:

1. Yule and Kendall : Introduction to Theory of Statistics.
2. Islam, M. Nurul. : An Introduction to Statistics and Probability.
3. Jalil A. and Ferdous R. : Basic Statistics.
4. Mostafa M.G. : Methods of Statistics.
5. David E.N. : Probability Theory for Statistical Methods.
6. Weatherburn C.F. : A First Course in Mathematical statistics.
7. Mosteller, Roure and Thomas : Probability with Statistical Applications.
8. Ali A. : Theory of Statistics Vol. I
9. Mallick, S.A. : *msuLk MmbZ*
10. Freeman H. : Actuarial, Mathematics Vols; I and II
11. Scarborough : Numerical Mathematics.
12. David F.N. : Probability theory for Statistical Methods.
13. Shil R.N. : Introduction to Theory of Statistics.
14. Feller, W : Introduction to Statistical Time Series (latest ed.).
15. Gupta and Kapoor : Applied Statistics.

1st Year Honours (2014-15)

Paper Code: 213608

Paper Title: **Statistics Practical -I**
Marks-50, 2(credits), 30 Lectures

Examination	Course Content	Lectures
1st Incourse (10 Lectures)	Condensation and tabulation of data. Graphical representation of data, Frequency table, Measures of Location. Dispersion, Moments, Skewness and Kurtosis.	5
	Measure of correlation coefficient, Rank , Correlation, Fitting of simple regression lines	3
	Finding trend values and seasonal variation from time series data by different methods	2
2nd Incourse (10 Lectures)	Fitting of Binomial, Normal and Poisson's distribution.	6
	Calculation of Index numbers and test of index number.	2
	Use of Newton's forward and backward formula, solution of numerical integration.	2
Test (10 Lectures)	Revision	10

Books Recommended:

1. Yule and Kendall : Introduction to Theory of Statistics.
2. Islam, M. Nurul. : An Introduction to Statistics and Probability.
3. Jalil A. and Ferdous R. : Basic Statistics.
4. Mostafa M.G. : Methods of Statistics.
5. David E.N. : Probability Theory for Statistical Methods.
6. Weatherburn C.F. : A First Course in Mathematical statistics.
7. Mosteller, Roure and Thomas : Probability with Statistical Applications.
8. Ali A. : Theory of Statistics Vol. I
9. Mallick, S.A. : *msuLK MtbZ*
10. Freeman H. : Acturial, Mathematics Vols; I and II
11. Scarborough : Numerical Mathematics.
12. David F.N. : Probability theory for Statistical Methods.
13. Shil R.N. : Introduction to Theory of Statistics.
14. Feller, W : Introduction to Statistical Time Series (latest ed.).
15. Gupta and Kapoor : Applied Statistics.

1st Year Honours (2014-15)

Course Code: 212707

Course Title: Physics-I (Mechanics, Properties of Matter, Waves & Optics)
Marks 100, 4 Credits, 60 Lectures

Exam	Chapter	Content	Lectures
1 st In-course (25 Lectures)	1 st	I. Vector Analysis: Vectors and scalars, Addition and multiplication of vectors, Triple scalar & vector products, Derivatives of vectors, Gradient, divergence and curl-their physical significance, Theorems of Gauss, Green & Stoke's.	6

	2 nd	2. Work, Energy and Power: Work energy theorem, Conservation of energy and linear momentum, Conservative and non-conservative forces and systems, Conservation of energy and momentum, Centre of mass, Collision problems.	5
	3 rd	3. Rotational Motions: Rotational variables, Rotation with constant angular acceleration, Relation between linear and angular kinematics, Torque on a particle, Angular momentum of a particle, kinetic energy of rotation and moment of inertia. Combined translational and rotational motion of a rigid body, Conservation of angular momentum.	4
	4 th	4. Gravitation: Centre of gravity of extended bodies, Gravitational field and potential their calculations, Determination of gravitation constant and gravity, Compound and kater's pendulums, Motion of planets and satellites, Escape velocity.	4
	5 th	5. Elasticity: Moduli of elasticity, poisson's ratio, Relations between elastic constants and their determination, Cantilever.	3
	6 th	6. Surface Tension: Surface tension as a molecular phenomenon, Surface tension and surface energy, Capillary rise or fall of liquids, Pressure on a curved membrane due to surface tension, Determination of surface tension of water, mercury and soap solution, Effect of temperature.	3
2 nd In-course (25 Lectures)	7 th	7. Fluid Dynamics: Viscosity and coefficient of viscosity, Poiseulle's equation, Determination of the coefficient of viscosity of liquid by Stoke's method, Bernoulli's theorem and its applications, Toricelli's theorem, Venturimeter.	5
	8 th	8. Waves: Mechanical waves, types of waves, travelling waves. The superposition principle. Wave speed, Power and intensity in wave motion. Interference of waves, Standing Waves and resonance.	5
	9 th	9. Oscillatory Motions: Simple harmonic motion, Combination of harmonic motions, Damped harmonic motion, Forced oscillations and resonance.	5
	10 th	10. Geometrical Optics: Fermat's Principles, Theory of equivalent lenses, Defect of images, Optical instrument, Dispersion rainbow.	5
	11 th	11. Nature and Propagation of light: Properties of light, Wave theory and Huygene's Principle, Theories of light.	5
Test (10 Lectures)	12 th	12. Interference: Young's experiment: Bi-prism, Newton's ring.	2
	13 th	13. Diffraction: Fresnels and Fraunhofer types, Diffraction through single slit and double slit, diffraction grating, Dispersive and resolving powers of gratings.	3
	14 th	14. Polarization: Plane, Elliptical and circular Polarizations, Optical, Rotatory dispersion, Polarimeters.	2
	1 st -14 th	Revision	3

Books Recommended:

1. Gm.Gg. tguKtQ° Avj x : Properties of Matter, Waves and Optics 2. Spiegel, M.R. : Vector Analysis 3. R.S. Halliday, R. Resnick, and J.Walker : Fundamentals of Physics 4. Halliday, D and Resnick, R. : Physics 5. Sears, F.W., Zimansky, M.W. and Young, H.D. : University Physics 6. Mathur, D.S. : Properties of Matter 7. Newman, F.W. and Serale, V.H.L : General Properties of Matter. 8. A text Book of Light : Choudhury, Saha & Pramanik 9. Fundamentals of Optics : F.A. Jenking & H.E. White 10. A Text Book of Light : K.G. Mazumder 11. Principles of Optics : B.K. Mathur

1st Year Honours (2014-15)

Course Code: 212709

Course Name: Physics-II (Heat, Thermodynamics and Radiation)

Examination duration: 2.5 hrs. Marks: 50 Credits: 2

Exam	Chapter	Content	Lectures
1 st In-course (12 Lectures)	1 st	1. Thermometry: Temperature, Concepts of thermal equilibrium, measurement of low and high temperature: Gas thermometers, Resistance thermometer, Thermocouple, Pyrometry, International temperature scale.	4
	2 nd	2. Calorimetry: Specific heats of solids, liquids and gases by method of mixture with radiation corrections: Newton's Law of cooling, Variations of specific heats, Atomic and molecular heats.	2
	3 rd	3. Transmission of Heat: Thermal conductivity, Determination of thermal conductivities of good and bad conductors.	3
	4 th	4. Thermodynamic Systems: Concept of internal energy: The first law of thermodynamics, Work and specific heats, Isothermal and adiabatic processes.	3
1 ²ⁿ In-course (12 Lectures)	5 th	5. The second law of thermodynamics: Reversible and irreversible processes: Carnot cycle, Efficiency of reversible engines, Absolute thermodynamic temperature scale, Change of phase: Clausius and Clapeyron equation, Porous plug experiment.	4
	6 th	6. Entropy: Entropy of an ideal gas, Temperature-entropy diagram, Increase of entropy.	4
	7 th	7. Thermodynamic Functions: The Maxwell's relations, Specific heat equations.	4
Test (06 Lectures)	8 th	8. Radiation: Concept of black body radiation, Kirchhoff's law, Stefan-Boltzmann law, Wien's displacement Law, Rayleigh-Jean's law, Planck's Radiation law, Pyrometers, Temperature of the sun.	3
	1 st to 8 th	Revision	3

Books Recommended:

1. Gm.Gg tgv KtQ` Avj x : Zvc I ZvcMzve`v :
2. Halliday, D, Resnick, R. and Walker, J. : Fundamentals of Physics
3. Sears, F.W., Zemansky, M.W. and Young, H.D. : University Physics
4. Zemansky, M.W. : Heat and Thermodynamics
5. Sears, F.W. : An Introduction to Thermodynamics
6. Hossain, T. : Text Book of Heat
7. Saha, M.N. and Srivastava, B.N. : A Treatise on Heat.



Department of Mathematics
Rajshahi Govt. City College, Rajshahi

2nd Year Honours (2014-2015)

Courses and Marks Distribution

Paper Code	Paper Title	Marks	Credits
223701	Calculus –II	100	4
223703	Ordinary Differential Equations	100	4
223705	Computer Programming (Fortran)	100	4
223706	Math Lab (Practical)	100	4
Any two of the following :			
222707	Physics-III (Electricity and Modern Physics)	100	4
222708		50	2
222807	General Chemistry-II	100	4
222809		50	2
223609	Methods of Statistics	100	4
223610	Statistics Practical (Introduction to Statistics + Methods of Statistics)	50	2
	Total =	700	28
221109	English (Compulsory)	100	Non-credit

Department of Mathematics
Rajshahi Govt. City College, Rajshahi

Course Plan

2nd Year Honours (2014-2015)

Paper Code: 223701

Paper Title: **Calculus-II**

Marks-100, 4(credits), 60 Class

Examination	Course Content	Lectures
1st Incourse (25 Class)	Vector valued functions of a single variable: Limits, derivatives and integrals of vector valued functions. Tangent lines to graphs of vector-valued functions. Arc length from vector view point. Arc length parametrization.	5
	Curvature of space curves: Definition. Curvature from intrinsic equations, Cartesian equations and parametric equations. Radius of curvature. Centre of curvature.	7
	Multiple Integration: Double integrals and iterated integrals. Double integrals over nonrectangular regions. Double integrals in polar coordinates. Area by double integrals. Triple integrals and iterated integrals	9
	Topics in Vector Calculus: Scalar and vector fields, Gradient, divergence and curl and their properties	4
2nd Incourse (25 Class)	Functions of several variables: Graphs of functions of two variables. Limits and continuity. Partial derivatives. Differentiability, linearization and differentials. The Chain rule. Partial derivatives with constrained variables. Directional derivatives; gradient vectors and tangent planes, Extrema of functions of several variables, Lagrange multipliers. Taylor's formula.	13
	Multiple Integration: Volume as a triple integral. Triple integral in cylindrical and spherical coordinates. General multiple integrals. Change of variables in multiple integrals. Jacobians.	7
	Topics in Vector Calculus: Line integrals, Green's theorem. Surface integrals. Stokes' theorem, Divergence theorem.	5
Test (10 Class)	Revision and Discussion	10

Books Recommends

1. H. Anton et al, Calculus with Analytic Geometry.
2. E. Swokowski, Calculus with Analytic Geometry.
3. L. Bers & P. Karal, Calculus with Analytic Geometry.
4. S. Lang, Calculus of Several Variables.

2nd Year Honours (2014-2015)

Paper Code: 223703

Paper Title: **Ordinary Differential Equations**

Marks-100, 4(credits), 60 Class

Examination	Course Content	Lectures
1st Incourse (25 Class)	Ordinary differential equations and their solutions: Classification of differential equations. Solutions. Implicit solutions. Singular solutions. Initial value problems. Boundary value problems. Basic existence and uniqueness theorems (statement and illustration only). Direction fields. Phase line.	8
	Solution of first order Differential equations: Separable equations. Linear equations. Exact equations. Special integrating factors. Substitutions and transformations. Homogeneous equations. Bernoulli equation. Riccati equation. First order higher degree equation-solvable for x, y and p . Clairaut's equation.	10
	Modelling with first order differential equations: Construction of differential equations as mathematical models (exponential growth and decay, heating and cooling, mixture of solution. Series circuit, logistic growth, chemical reaction, falling bodies). Model solutions. and interpretation of results. Orthogonal trajectories.	7
2nd Incourse (25 Class)	Solution of higher order linear equations: Linear differential operators. Basic theory of linear differential equations. Solution space of homogeneous linear equations. Fundamental solutions of homogeneous solutions. Reduction of orders, Homogeneous linear equations with constant coefficients. Non-homogeneous equation. Method of undetermined coefficients. Variation of parameters. Euler-Cauchy differential equation.	15
	Series solutions of second order linear equations : Taylor series solutions. Frobenius series solutions. Series solutions of Legendre, Bessel, Laguerre and Hermite equations and their solutions.	10
Test (10 Class)	Revision and Discussion	10

Books Recommends

1. S.L. Ross- *Diferential Equations*.
2. Denis Gill-*Introduction to Diferential Equations*.
3. Frank Ayres, J R. *Theory and Problems of Difrential Equations*.
4. Martin Braun. *An introduction to Diferential Equations and their Applications*.

2nd Year Honours (2014-2015)

Paper Code: 223705

Paper Title: **Computer Programming**

Marks-100, 4(credits), 60 Class

Examination	Course Content	Lectures
1st Incourse (25 Class)	Problem-solving techniques using computers: Flowcharts, Algorithms.	10
	Programming in Fortran: Syntax and semantics, data types and structures, input/output, loops, decision statements, Arrays, user-defined functions, subprograms and recursion.	15
2nd Incourse (25 Class)	Subprogram: function, subroutine, recursion.	10
	Computing using Fortran: Construction and implementation of FORTRAN programs for solving problems in mathematics and sciences.	15
Test (10 Class)	Revision and Discussion	10

Books Recommends

1. Gordon B Davis, Thomas R Hoffmann. Fortran 77: A structured, Disciplined Style.
2. Schaum's Outline Series- Programming with Fortran 77.
3. Ian D Chivers, Jane Sleightholme. Introduction to programming with FORTRAN.
4. Prof. Md. Elias Hossain: Computer Technique.

2nd Year Honours (2014-2015)

Course Code: 223706

Course Name: **Math Lab (Practical)**

Marks-100, 4(credits), 60 Lectures

Examination	Course Content	Lectures
	Running the package, Numerical computation, Algebraic computation, Mathematical functions, Derivatives and integrals, Limits and series, Lists and matrices.	30
	Graphics, Standard packages, solving problems in Algebra, Geometry, Calculus, Computing.	30

Books Recommended:

1. Schaum's Outline Series : *Mathematica*
2. Worlfarm's Research (Student edition) : *Mathematica*

2nd Year Honours (2014-2015)

Course Code: 222707

Course Name: Physics-III (Electricity and Modern Physics)
Marks-100, 4 credits, (60 Lectures)

Examination	Course Content	Lectures
1st Incourse (25 Lectures)	1. Charge and Matter: Concept of charge, Conservation of charge. Coulomb's law.	2
	2. The Electrostatic Field: The Electric field strength due to a point charge, a dipole, Group of charged and uniformly distributed charged bodies.	3
	3. The electrostatic potential: Potential due to a point charge, a dipole, a group of charged and a continuous distribution of charged bodies. Notion of gradient: Relation between potential and electric field strength. Electric potential energy. Van de Graff generator.	4
	4. Flux of electrostatic field: Gauss's law. Concept of solid angle. Flux due to a point charge, group of charge. Conservation of flux. Application of Gauss's law.	3
	5. Capacitor and Dielectrics: Capacitance, Parallel plate and cylindrical capacitor. Dielectrics and Gauss's law. Energy storage in an electric field.	4
	12. Electronics: Vacuum diodes and triodes, P-type, n-type semiconductors, p-n junctions, Transistors, Transistor biasing, Transistor amplifiers, Transmitters and Receivers.	4
	13. Special Theory of Relativity: Inertial frame, Galilean transformation, Michelson-Morley experiment, Postulates of special theory of relativity, Lorentz transformation equations space contraction, Time dilation, Relativity of mass, Mass and energy.	5
2nd Incourse (25 Lectures)	6. Electric Current (D.C): Electromotive force, Current and current density. Resistance, Resistivity and conductivity, Ohm's law, Atomic view of resistivity, Energy transfer in an electric circuit, Kirchhoff's laws and their applications. Potentiometer. Meter bridge and Post office box.	3
	7. The Magnetic field: Magnetic Induction B. Motion of a charge field. Magnetic force on a current, Torque on a current loop, the Hall effect, Circulating charges. Dead beat and ballistic galvanometers, Thomson's experiment, Ampere's law, B near a long wire, Ampere's circuital law, B due to a solenoid, the Biot-Savart law and its applications.	4
	8. Electromagnetic induction: Faraday's law of induction, Lenz's law, Self and mutual inductance. Time-varying magnetic fields, Energy density in a magnetic field.	4
	9. Magnetic Properties of matter: Magnetic dipole, Gauss's Law for magnetism, Paramagnetism, Diamagnetism and ferromagnetism, Nuclear magnetism, Energy in a magnetic field, Hysteresis.	2
	10. Varying current: Growth and decay of currents in LR, CR and LCR circuits.	4
	11. Alternating Currents: AC generator, Concept of r.m.s and average values of current and voltage, Resistive circuit, CR, LR and LCR circuits in series and parallel, Resonance, Phase and Power transformer.	4
	16. The atomic nucleus: The nuclear constituents, The nuclear force, Nuclear radius, Stable nuclei, The binding energy of stable nuclei mass defect and Packing fraction.	2
Test (10 Lectures)	17. Radioactivity: Meaning of radioactivity, Unstable nuclei, Exponential decay law, Half life, Mean life and units of radioactivity, Basic ideas of nuclear reactor, Nuclear fission and Nuclear fusion.	2
	14. Light and Quantum Physics: Planck's radiation formula, Photoelectric effect, Einstein's Photon theory, The Compton effect, The hydrogen atom and The correspondence principle.	3
	15. Waves and particles: Matter waves, atomic structure and standing waves, Mechanics, Uncertainty principle.	2
	Revision	5

Books Recommended:

1. Halliday, D, Resnick, R and Walker, J : Fundamentals of Physics
2. Halliday, D and Resnick, R. : Physics

3. Husain, A & Islam, S : Parmanabik Bijnan
4. Emran, M, Ishaque, M & Islam, A.M.Z. : A Text Book of Magnetism, Electricity & Modern Physics.
5. Besier, A. : Concepts of Modern Physics
6. Semat, H. : Introduction to Atomic and Nuclear Physics.

2nd Year Honours (2014-2015)

Course Code: 222708

Course Name: Physics-IV (Physics Practical)

Marks-50, 2 credits, (Class Hour45)

Examination	Course Content	Lectures
1st Incourse (25 Class)	<p style="text-align: center;">Group – A</p> <ol style="list-style-type: none"> 1. Determination of ‘g’ by compound pendulum. 2. Determination of Young’s and rigidity moduli by Searle’s dynamic method. 3. Rigidity modulus by static method. 4. Surface tension of water by capillary tube method. 5. To determine the spring constant and effective mass of a given spiral spring and hence to calculate the rigidity modulus of the material of the spring. 6. To determine the Young’s modulus by the flexure of a beam (bending method). 7. To determine the moment of inertia of a fly-wheel about its axis of rotation. 8. Determination of surface tension of mercury by Quincke’s method. 9. To determine the specific heat of solid by method of mixture, with radiation correction. 10. To determine the specific heat of a liquid by the method of cooling. 11. To determine the thermal conductivity of a bad conductor by Lee’s method. 12. To determine ‘J’ with radiation correction. 13. To verify the laws of transverse vibration of a stretched string with a sonometer (n-1, and n-T curves only) 14. To find the frequency of a tuning fork by Melde’s experiment. 	25
2nd Incourse (15 Class)	<p style="text-align: center;">Group – B</p> <ol style="list-style-type: none"> 1. Comparison of e.m.f.s of two cells by potentiometer. 2. Determination of galvanometer resistance by half deflection method. 3. Determination of low resistance by fall of potential method. 4. Determination of figure of merit of a galvanometer. 5. To determine ECE of copper/silver. 6. Determination of the refractive index of a glass prism by a spectrometer. 7. Determination of Cauchy’s constant and the resolving power of a prism using a spectrometer. 8. Determination of wavelength of light by Newton’s rings. 9. Determination of wavelength of light using a bi-prism. 10. Specific rotation of plane of Polarization in sugar solution by polarimeter. 	15
Test (5 Class)	Revision	5

Books Recommended:

1. c`v`@Ab e`enwiK- c`dmi tgr: nweej ingvb,
2. Ahmed, G.U. and Uddin, M.S. : Practical Physics
3. Chawdhury, S.A. and Bashak, A.K. : e`enwiK c`v`@e`v`
4. Din, K. and Matin, M.A. : Advanced Practical Physics
5. Worsnop and Flint : Advanced Practical Physics

2nd Year Honours (2014-2015)

Course Code: 223609

Course Name: **Method of Statistics**

Marks-100, 4(credits), 60 Lectures

Examination	Course Content	Lectures
1st Incourse (25 Lectures)	1. Sampling Distribution: Concept of sampling distribution of Statistics and its standard error, \bar{x} , t and F statistics and their distributions, properties and uses of these distributions. χ^2	06
	2. Design of Experiment: Principles of experimental design and analysis of variance, Meaning of experiments and randomization, Replication and local control, Basic designs: CRD, RBD and LSD, Analysis of these designs, Estimation of parameters, Missing plot estimation and analysis, Factorial experiment, 2^2 , 2^3 . factorial experiments, Analysis and interpretation of these designs.	12
	3. Survey Methods: Concept of population, Sample, Sampling, Types of sampling, Principles of random sampling, Census and surveys, Advantages and limitations of sample survey over census, Sampling frame. Sampling and non-sampling errors, Detailed study of simple random sampling, Stratified random sampling, Systematic sampling and cluster sampling, Concept of quota sampling, Multistage sampling.	07
2nd Incourse (25 Lectures)	4. Test of Hypothesis: Concept of test of hypothesis, Logic behind tests of hypothesis, Neyman Pearson's approach of testing hypothesis, Preliminaries of tests: Hypothesis, Null and alternative hypotheses, Simple and composite hypotheses, Concept of test of significance, Procedures of testing a hypothesis, Test errors, Level of significance, One-tailed and two-tailed tests, P-value. Concept of test statistics: Normal, χ^2 , t and F statistics.	15
	5. Testing the significance of a single mean, Single variance, Single proportion, Difference of two means and two proportions, Ratio of two variances and their confidence intervals, Confidence intervals concerning simple correlation coefficient and regression coefficient for single and double sample, Paired t-test, Testing the homogeneity of several population means, Variance and proportions, Test of goodness of fit.	10
Test (10 Lectures)	Revision	10

Books Recommended:

- | | | |
|-----------------------|---|---|
| 1. David F.N. | : | Probability theory for statistical Methods |
| 2. Levy H, and Roth L | : | Elements of Probability |
| 3. Mostafa M.G. | : | Methods of Statistics |
| 4. Islam M.N. | : | Introduction to Statistics and probability. |
| 5. Kapoor; Saxena | : | Mathematical Statistics |
| 6. Ali A. | : | Theory of statistics Vol. I |

7. Mood, Graybill and Boes : Introduction to the Theory of Statistics 3rd Ed.
8. Hogg, R.V. and Craig, A.T. : An introduction to Mathematical Statistics.
9. Federer : Experimental Design; Theory and Applications.
10. Mallick S .A. : Parikkaneer Design.
11. Bhuiyan M.R. : Fundamentals of Experimental Design.
12. Anderson, R.L. and Bancroft. T.A. : Statistical Theory in Research
13. Mood and Graybill : Introduction to the Theory of Statistics
14. Weather Burn C.E. : A First Course in Mathematical Statistics
15. Cochran G.W. : Sampling Techniques

2nd Year Honours (2014-2015)

Course Code: 223610

Course Name: **Statistics Practical (Introduction of Statistics + Method of Statistics)**

Marks-50, 2(credits), 30 Lectures

Examination	Course Content	Lectures
1st Incourse (10 Lectures)	1. Introduction to Statistics: Condensation and tabulation of data, Graphical representation of data, Frequency table, Measures of location, Dispersion, Moments, Skewness and Kurtosis, Measures of correlation coefficient, Rank correlation, Fitting of simple regression lines, Fitting of Binomial, Normal and Poisson distributions, Finding trend values and seasonal variation from time series data by different methods, Calculation of index numbers and test of index number, Use of Newton's forward and backward formula, Solution of numerical integration.	10
2nd Incourse (10 Lectures)	2. Methods of Statistics: Analysis of basic designs, Missing plot estimation and analysis of these designs, Measures of relative efficiency, Analysis of factorial designs, Drawing of SRS, Estimation of mean and properties with standard error in SRS, Drawing of stratified random samples and estimation of mean and variance of population from samples of stratified random samples, Cluster samples, Systematic samples and determination of relative efficiency.	07
	3. Test of Hypothesis: Common tests of significance of Mean, Variance, Proportion, Correlation coefficient and Regression coefficient, Fitting of theoretical distributions and testing of goodness of fit, tests of large samples, Tests of homogeneity, Construction of confidence intervals.	03
Test (10 Lectures)	Revision	10

Books Recommended:

1. David F.N. : Probability theory for statistical Methods
2. Levy H, and Roth L : Elements of Probability
3. Mostafa M.G. : Methods of Statistics
4. Islam M.N. : Introduction to Statistics and probability.
5. Kapoor; Saxena : Mathematical Statistics
6. Ali A. : Theory of statistics Vol. I
7. Mood, Graybill and Boes : Introduction to the Theory of Statistics 3rd Ed.
8. Hogg, R.V. and Craig, A.T. : An introduction to Mathematical Statistics.
9. Federer : Experimental Design; Theory and Applications.
10. Mallick S .A. : Parikkaneer Design.
11. Bhuiyan M.R. : Fundamentals of Experimental Design.

12. Anderson, R.L. and Bancroft. T.A. : Statistical Theory in Research
 13. Mood and Graybill : Introduction to the Theory of Statistics
 14. Weather Burn C.E. : A First Course in Mathematical Statistics
 15. Cochran G.W. : Sampling Techniques

2nd Year Honours (2014-2015)

Compulsory English

Course Code: 221109

Total Marks: 100(Non Credit), 60 Lectures

Examination	Topic	Lectures
1 st in-course (25 Lectures)	Understanding different purposes and types of readings. Guessing word-meaning in context. Understanding long sentences. Recognizing main ideas and supporting ideas. Answering comprehension questions. Writing summaries.	05 Lectures
	Writing correct sentences, completing sentences and combining sentences.	02 Lectures
	Situational writing: Posters, notices, slogans, memos, advertisements etc.	04 Lectures
	Paragraph writing: Structure of paragraph, topic sentences, developing ideas, writing a conclusion, types of paragraphs (narrative, descriptive, expository, persuasive), techniques of paragraph development (listing, cause and effect, comparison and contrast).	02 Lectures
	Word order of sentence.	02 Lectures
	Framing questions.	02 Lectures
	Tenses, articles, subject-verb agreement, noun-pronoun agreement, verbs, phrasal verbs, conditionals, prepositions and prepositional phrases, infinitives, participles, gerunds, (knowledge of grammar will be tested through contextualized passages.)	08 Lectures
2 nd in-course (25 Lectures)	Newspaper writing: Reports, press release, dialogues etc.	04 Lectures
	Writing resume.	02 Lectures
Examination	Topic	Lectures
2 nd in-course (25 Lectures)	Writing letters: Formal and informal letters, letters to the editor, request letters, job applications, complaints letters etc.	05 Lectures
	Punctuation.	03 Lectures
	Developing vocabulary: Using the dictionary, suffixes, prefixes, synonyms, antonyms, changing word forms (from verb to noun etc.) and using them in sentences	06 Lectures
	Translation from Bangla to English	05 Lectures
Test (10 Lectures)	Essay: Generating ideas, outlining, writing a thesis sentence; writing the essay; writing introductions, developing ideas, writing conclusions; revising and editing.	05 Lectures
	Revision of 1 st and 2 nd in-course	05 Lectures



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3rd Year Honours (2014-2015)

Courses and Marks Distribution

Paper Code	Paper Title	Marks	Credits
233701	Abstract Algebra	100	4
233703	Real Analysis	100	4
233705	Numerical Analysis	100	4
233707	Complex Analysis	100	4
233709	Differential Geometry	100	4
233711	Mechanics	100	4
233713	Linear Programming	100	4
233714	Math Lab (Practical)	100	4
	Total =	800	32

3rd Year Honours (2014-2015)

Course Code: 233701

Course Name: **Abstract Algebra**

Marks-100, 4(credits), 60 Lectures

Examination	Course Content	Lectures
1st Incourse (25 Lectures)	Congruence: Relations, Binary Relation, Types of Relation, Equivalence relations and classes. Properties of equivalence, Congruence relation, Binary operations, Laws of Binary operations, Identity element and Inverse element with respect to binary operation. Solved examples.	5
	Groups: Group, Some special groups, order of an element of a group, some theorems on group, Alternative postulates for a group, Solved example Residue classes of set of Integers: Introduction, Addition and multiplication modulo m , some theorems on modulo composition, Equivalence relation of modulo m , Residue classes, Solved examples	10
	Subgroup: Subgroup, Improper and proper subgroup, Fundamental theorem, Theorem on subgroup, Theorem on cyclic group. Cyclic group: Cyclic group, Theorem on Cyclic group Permutation: Permutation, Cyclic permutation, Even and odd permutation, some theorem, order of an element of a group. Coset of a group: Coest, Index, Theorem on coset, LaGrange's theorem.	10
2nd Incourse (25 Lectures)	Normal subgroup: Normal subgroup, proper and improper normal subgroup, some theorem on Normal subgroup, Quotient group, some theorems Quotient group.	7
	Homomorphism: Some definitions, Isomorphism, Some theorems, Fundamental of 1st theorem of homomorphism, 2nd Isomorphism theorem, 3rd Isomorphism theorem, Automorphism of a group.	7
	Rings: Conception of ring, ring, various types of ring, Integral domain, Ideal and factor rings, Rings homomorphism, order integral domains. Elementary properties of ring, subgroups. Ideal and quotient ring.	11
	Polynomial: Polynomial in one and several indeterminates over ring. Division algorithm, uniqueness of factorization in polynomial domain. Fields: Definition and simple properties, the characteristic, Subfields, Algebraic extensions, splitting fields, Finite field. Minimal polynomial.	6
Test (10 Lectures)	Revision and Discussion	4

Books Recommended:

- | | |
|--|--|
| 1. W. K. Nicholson | : <i>Introduction to Abstract Algebra</i> |
| 2. Neal H. McCoy | : <i>Introduction to Abstract Algebra.</i> |
| 3. Hiram. Paley and P. M. Weichsel | : <i>First Course in Abstract Algebra.</i> |
| 4. P. B. Bhattacharya. S. K. Jain, S. R. Nagpaul | : <i>Basic Abstract Algebra.</i> |
| 5. F. Chowdhury, M. R. Chowdhury | : <i>A Textbook of Abstract Algebra.</i> |
| 6. Prof. Dr. Fazlur Rahman | : <i>Abstract Algebra.</i> |

3rd Year Honours (2014-2015)

Course Code: 233703

Course Name: **Real Analysis**

Marks-100, 4(credits), 60 Lectures

Examination	Course Content	Lectures
1st Incourse (25 Lectures)	Real numbers as complete ordered fields: Supremum and infimum principles. Dedekind theorem and its equivalence. Archimedean property. Denseness of rational and irrational numbers.	6
	Topology of real line : Neighborhoods. Open and closed sets. Limit points and Bolzano-Weierstrass theorem. Interior, boundary and closure. Compact sets. Heine-Borel theorem. Connected sets.	7
	Real sequences: Convergence. Theorems on limits. Subsequential limits. Limit superior & limit inferior, Monotone sequence. Cauchy sequence. Absolute convergence.	6
	Infinite series of real numbers: Convergent and divergent series. Test for convergence (comparison tests, root test, ratio test, integral test, Raabe's test, Gauss's test). Rearrangements.	6
2nd Incourse (25 Lectures)	Real continuous functions: Local properties. Global properties (global continuity theorem, Preservation of compactness, maximum and minimum value theorem, intermediate value theorem, preservation of connectedness, uniform continuity).	5
	Differentiability of real functions: Basic properties. Rolle's theorem. Mean value theorem. Taylor's Theorem.	3
	Integration of real functions: Riemann sum and Riemann integral. Conditions for integrability. Properties of integrals. Darboux theorem. Fundamental theorem of calculus. Mean value theorem for integrals. Leibnitz theorem on differentiation under integral sign. Riemann-Stieltjes integration.	6
	Sequences and Series of Real Numbers: Point-wise convergence and uniform convergence. Tests for uniform convergence. Cauchy criterion. Weierstrass M -test. Continuity, differentiability and integrability of limit functions of sequences and series of functions.	6
	Euclidean n-spaces: Norms in R^n . Distance in R^n . Convergence and completeness. Compactness. Continuous functions and their properties.	5
Test (10 Lectures)	Revision and Discussion	10

Books Recommended:

1. Kenneth A. Ross : *Elementary Analysis: The theory of Calculus.*
2. Robert G. Bartle, Donald R. Sherbert : *Introduction to Real Analysis.*
3. Walter Rudin: *Principles of Mathematical Analysis.*
4. *Real Analysis* –By P. N. Chatterjee
5. *Real Analysis*- Prof. Horidas Halder

3rd Year Honours (2014-2015)

Course Code: 233705

Course Name: Numerical Analysis

Marks-100, 4(credits), 60 Lectures

Examination	Course Content	Lectures
1st Incourse (25 Lectures)	Solution of equation in one variable: Bisection algorithm. Method of false position. Fixed point iteration. Newton-Raphson method. Convergence analysis.	6
	Interpolation and polynomial approximation: Taylor polynomials. Interpolation and Lagrange polynomial. Iterated interpolation. Extrapolation.	9
	Differentiation and Integration: Numerical differentiation. Richardson's extrapolation. Elements of Numerical Integration. Adaptive quadrature method. Romberg's integration. Gaussian quadrature.	10
2nd Incourse (25 Lectures)	Solutions of linear systems: Gaussian elimination and backward substitution. Pivoting strategies. LU decomposition method.	4
	Iterative techniques in matrix algebra: Linear systems of equations. Error estimations and iterative refinement. Eigenvalues and eigenvectors. The power method. Householder's method. Q-R method.	6
	Initial value problems for ODE : Euler's and modified Euler's method. Higher order Taylor's method. Single-step method (Runge-Kutta, extrapolation), Multi-step method (Adams-Bashforth, Adams-Moulton, Predictor-Corrector).	8
	Boundary value problems for ODE: Shooting method for linear and nonlinear problems. Finite difference method for linear and nonlinear problems.	7
Test (10 Lectures)	Revision and Discussion	10

Books Recommended:

1. R. L. Burden & J. D. Faires, *Numerical Analysis*.
2. M. A. Celia & W. G. Gray, *Numerical Methods for Differential Equations*.
3. L. W. Johson & R. D. Riess, *Numerical Analysis*.

3 rd Year Honours (2014-2015)

Course Code: 233705
 Course Name: Complex Analysis
 Marks-100, 4(credits), 60 Lectures

Examination	Course Content	Lectures
1st Incourse (25 Lectures)	Metric Properties of complex plane. Functions of a complex variable. Differentiability of a complex function.	9
	Analytic functions and their properties. Harmonic functions.	8
	Complex integration: Line integration over rectifiable curves. Cauchy-Goursat theorem. Cauchy's integral formulae. Fundamental theorem of algebra. Liouville's theorem.	8
2nd Incourse (25 Lectures)	Morera's theorem. Different types of singularities. Residues. Taylor's and Laurent's expansion.	8
	Entire functions. Meromorphic function. Cauchy's residue theorem. Evaluation of integrals by contour integration. Branch points and cuts.	10
	Rouche's theorem. The maximum modulus principle. Conformal mapping. Bilinear transformations.	7
Test (10 Lectures)	Revision and Discussion	10

Books Recommended:

1. Ruel V. Churchill- *Complex Variables and Applications*.
2. Schaum's Outline Series- *Complex Variables*.
3. *Fazlur Rahman-Complex Analysis*
4. *Taggi- Complex Variables*.

3 rd Year Honours (2014-2015)

Paper Code: 233709
 Paper Titel: Differential Geometry
 Marks-100, 4(credits), 60 Lectures

Examination	Course Content	Lectures
1st Incourse (25 Lectures)	Curves in space: Vector functions of one variable. Space curves. Unit tangent to a space curve. Equation of a tangent line to a curve. Osculating plane.	9
	Vector function of two variables. Tangent and normal plane for the surface $f(x,y,z)=0$. Principal normal. Binormal. Curvature and	8

	torsion. Serret- Frenet formulae. Theorems on curvature and torsion.	
	Helices and their properties. Circular helix. Spherical indicatrix, Curvature and torsion for spherical indicatrices. Involute and Evolute of a given curve. Bertrand curves.	8
2nd Incourse (25 Lectures)	Surface: Curvilinear coordinates, parametric curves, Analytical representation, Monge's form of the surface, first fundamental form, relation between coefficients E, F, G ; properties of metric, angle between any two directions and parametric curves, condition of orthogonality of parametric curves, elements of area, unit surface normal, tangent plane, Weingarten equations (or derivatives of surface normal).	10
	Second fundamental form, Normal curvature. Meusnier's theorem. Curvature directions. Condition of orthogonality of curvature directions. Principal curvatures. Lines of curvature. First curvature mean curvature, Gaussian curvature, centre of curvature, Rodrigues' formula.	8
	Euler's Theorem. Elliptic, hyperbolic and parabolic points. Dupin Indicatrix. asymptotic lines. Third Fundamental form.	7
Test (10 Lectures)	Revision and Discussion	10

Books Recommended:

1. L. P. Eisenhart : *An Introduction to Differential Geometry.*
2. Schaum's Outline Series : *Differential Geometry.*
3. C. E. Weatherburn : *Differential Geometry of three dimensions.*
4. D. J. Struik: *Lectures on Classical Differential Geometry.*
5. T. T. Willmore : *An Introduction to Differential Geometry.*

3 rd Year Honours (2014-2015)

Paper Code: 233711

Paper Title: Mechanics

Marks-100, 4(credits), 60 Lectures

Examination	Course Content	Lectures
1st Incourse (25 Lectures)	Motion of a particle in one dimension: Momentum and energy equations. One-dimensional motion under variable forces. Falling bodies. Simple harmonic oscillator. Damped harmonic oscillator. Forced harmonic oscillator.	13
	Motion of a particle in two or three dimensions: Kinetics in a plane. Kinematics in three dimensions. Momentum and energy theorems. Plane and vector angular momentum theorems. Projectiles. Harmonic oscillator in two and three dimensions.	12

	Motion under a central force. Elliptic orbits. Hyperbolic orbits.	
2nd Incourse (25 Lectures)	Gravitation: Centers of gravity of solid bodies. Gravitational field and gravitational potential.	9
	Lagrange's equations: Generalized coordinates. Lagrange's equations. Systems subject to constraints.	7
	Motion of rigid bodies: Moment of inertia. D'Alembert's principle. Motion about fixed axes.	9
Test (10 Lectures)	Revision and Discussion	10

Books Recommended:

1. S. L. Loney- *An Elementary treatise on Statics.*
2. S. L. Loney- *An Elementary treatise on the Dynamic of a Particle & of Rigid Bodies.*
3. L. A. Pars : *Introduction to Dynamics.*
4. Hafiz And Rahman-Mechanics
5. Q. S. Sajedur Rahman - Mechanics

3rd Year Honours (2014-2015)

Paper Code: 233713

Paper Title: Linear Programming
Marks-100, 4(credits), 60 Lectures

Examination	Course Content	Lectures
1st Incourse (25 Lectures)	Convex sets and related theorems.	7
	Introduction to linear programming. Feasibility and optimality.	6
	Formulation of linear programming problems.	6
	Graphical solutions.	6
2nd Incourse (25 Lectures)	Simplex method. Two phase and Big-M simplex methods.	7
	Duality of linear programming and related theorems. Dual simplex method.	6
	Sensitivity analysis in linear programming.	6
	Transportation and assignment problems.	6
Test (10 Lectures)	Revision and Discussion	10

Books Recommended:

1. F. S. Hiller and G. T. Lieberman : *Linear Programming.*
2. P. R. Thie : *Introduction to Linear Programming and Game theory.*
3. N. S. Kambu : *Mathematical Programming Techniques.*
4. Hamdy A. Taha : *Operations Research.*

5. Prof. Dr. Ganesh Chanra Ray: Linear Programming.

3rd Year Honours (2013-2014)

Course Code: 233714

Course Name: **Math Lab (Practical)**

Marks-100, 4(credits), Lectures: 60

Problem solving in concurrent Papers (e.g., Calculus, Complex Analysis, Numerical Analysis and Linear Programming) using FORTRAN.

Lab Assignments: There will be at least 20 lab assignments. Evaluation: Internal Assessment (Laboratory works): 30 marks. Final Exam (Lab : 3 hours) : 70 marks

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4th Year Honours (2014-2015)

Courses and Marks Distribution

Paper Code	Paper Title	Marks	Credits
243701	Theory of Numbers	100	4
243703	Topology & Functional Analysis	100	4
243705	Methods of Applied Mathematics	100	4
243707	Tensor Analysis	100	4
243709	Partial Differential equations	100	4
243711	Hydrodynamics	100	4
Any Two of the following			
243713	Discrete Mathematics	100	4
243715	Astronomy	100	4
243717	Mathematical Modeling in Biology	100	4
243718	Math Lab (Practical)	100	4
243720	Viva-Voce (Comprehensive)	100	4
	Total =	1000	40

4th Year Honours (2014-2015)

Paper Code: 243701

Paper Title: Theory of Numbers

Marks-100, 4 credits, (60 Lectures)

Examination	Course Content	Lectures
1 st Incourse (25 Lectures)	Arithmetic in \mathbb{Z} .	5
	Euclidean algorithm.	4
	Continued fractions.	4
	The ring \mathbb{Z} , and its group of units.	4
	Chinese remainder theorem.	4
	Linear Diophantine equations.	4
2 nd Incourse (25 Lectures)	Arithmetical functions.	4
	Dirichlet convolution.	4
	Multiplicative function.	5
	Representation by sum of two and four squares.	4
	Arithmetic of quadratic fields.	4
	Euclidean quadratic fields.	4
TEST (10 Lectures)	Revision	10

Books Recommended :

1. Niven, H. S. Zuckerman : *An Introduction to the Theory of Numbers*.
2. G. H. Hardy & E. M. Wright, *An introduction to Theory of Numbers*.
3. I. S. Niven and H. S. Zuckermann, *An introduction to Theory of Numbers*.
4. W. J. LeVeque, *Fundamentals of Number Theory*.
5. Fazlur Rahman – *Theory of Numbers*

4th Year Honours (2014-2015)

Paper Code: 243703

Paper Title: Topology and Functional Analysis
Marks-100, 4 credits, (60 Lectures)

Examination	Course Content	Lectures
1st Incourse (25 Lectures)	Metric Spaces: Definition with examples. Open sets. Closed sets. Convergence. Completeness. Baire's theorem. Continuous mappings. Spaces of continuous functions. Euclidean and unitary spaces.	8
	Topological Spaces: Definition with examples. Elementary concepts. Open bases and open subbases. Weak topologies. Function algebras.	8
	Compactness: Compact spaces. Product spaces. Tychonoff 's theorem. Locally compact spaces. Compactness for metric spaces.	3
	Separation: T_1 -spaces and Hausdorff spaces. Completely regular spaces and normal spaces.	3
	Connectedness: Connected spaces. Locally connected spaces. Pathwise connectedness.	3
2nd Incourse (25 Lectures)	Banach Spaces: Definition with examples. Continuous linear transformations. Hahn-Banach theorem. Natural embedding. Open mapping theorem. Conjugate of an operator.	10
	Hilbert Spaces: Definition and simple properties. Orthogonal complements. Orthogonal sets. Conjugate spaces. Adjoint and self-adjoint operators.	11
	Fixed point theory : Banach contraction principle (with proof). Schauder Principle. (without proof). Applications.	4
10 Lectures	Revision and Discussion	10

Books Recommended :

1. G. Simons – *Introduction to Topology and Modern Analysis.*
2. S. Willard- *General Topology.*
3. Fatema Chowdhury and Munibur Raman Chowdhury – *Essentials of Topology and Functional Analysis*
4. Fazlur Rahman – *Topology*

4th Year Honours (2014-2015)

Paper Code: 243705

Paper Title: Methods of Applied Mathematics
Marks-100, 4 credits, (60 Lectures)

Examination	Course Content	Lectures
1st Incourse (25 Lectures)	Fourier Series: Fourier series and its convergence. Fourier sine and cosine series. Properties of Fourier series. Operations on Fourier series. Complex form. Applications of Fourier series.	9
	Laplace transforms: Basic definitions and properties, Existence theorem. Transforms of derivatives. Relations involving integrals. Laplace transforms and application to initial value problems and ordinary differential equations. Transforms of periodic functions. Transforms of convolutions. Inverse transform. Calculation of inverse transforms. Applications.	8
	Fourier transforms: Fourier transforms. Inversion theorem. sine and cosine transforms. Transforms of derivatives. Transforms of rational functions. Convolution theorem. Parseval's theorem. Applications to boundary value problems and integral equation.	8
2nd Incourse (25 Lectures)	Special functions: Gamma and Beta functions. Error function. Legendre functions (Generating function, recurrence relations and other properties of Legendre polynomials, Legendre differential equation, Legendre function of the first kind, Legendre function of the second kind, associated Legendre functions). Bessel functions (Generating function, recurrence relations, Bessel differential equation, Integral representations, Orthogonality relations, Modified Bessel functions). Laguerre polynomials (Generating function, Rodrigue formula, Orthogonality relations, Recurrence relations). Hermite polynomials (Generating function, Rodrigue formula, orthogonal properties, Hermite differential equation, recurrence relations). Hypergeometric and confluent hypergeometric functions. Expansion theorem.	14
	Eigenvalue problems and Strum-Liouville boundary value problems: Regular Strum-Liouville boundary value problems. Nonhomogeneous boundary value problems. Solution by eigenfunction expansion. Green's functions. Singular Strum-Liouville boundary value problems.	11
10 Lectures	Revision	10

Book Recommended :

1. R. V. Churchill & J. W. Brown- *Fourier series & boundary value problems.*
2. M. R. S. Piekel- (i) *Fourier analysis with application to boundary value problems*
(ii) *Laplace Transforms.*
3. L. A. Pipes & L. R. Harvill- *Applied mathematics for engineering and physics.*
4. W. N. Lebedev & R.A. Silverman, *Special Functions and their Applications.*
5. M. R. Spiegel, Schaum's Outline Series: *Laplace Transforms.*

4th Year Honours (2014-2015)

Paper Code: 243707

Paper Title: Tensor Analysis

Marks-100, 4 credits, (60 Lectures)

Examination	Course Content	Lectures
1st Incourse (25 Lectures)	Coordinates, vectors and tensors: Curvilinear coordinates. Kronecker delta. Summation convention. Space of n -dimensions. Euclidean and Riemannian spaces.	4
	Coordinates, vectors and tensors: Coordinate transformation. Contravariant and covariant vectors. The tensor concept. Symmetric and skew-symmetric tensors.	4
	Riemannian metric and metric tensors: Basis and reciprocal basis vectors. Euclidean metric in three dimensions, Reciprocal or conjugate tensors. Conjugate metric tensor.	8
	Riemannian metric and metric tensors: Associated vectors and tensor's length. Angle between two vector's. The Christoffel symbols.	9
2nd Incourse (25 Lectures)	Covariant Differentiation of Tensors : Covariant derivatives of tensors. Covariant curvature tensor. The Ricci identity. The Ricci tensor.	7
	Covariant Differentiation of Tensors : Scalar Curvature. Bianchi's identity.	6
	Application of Tensors: Applications of tensor analysis to elasticity theory and electromagnetic theory.	12
Test (10 Lectures)	Revision	10

Book Recommended :

1. Schaum's Outline Series : *Vector and Tensor Analysis*.
2. B. Spain : *Tensor Calculus*.
3. C. E. Weatherburn : *An Introduction to Riemannian Geometry and the Tensor Calculus*.
4. A.J. McConnell, *Applications of Tensor Analysis*.
5. Abu Yousuf- *Tensor Analysis*.

4th Year Honours (2014-2015)

Paper Code: 243709

Paper Title: Partial Differential Equations

Marks-100, 4 credits, (60 Lectures)

Examination	Course Content	Lectures
1 st Incourse (25 Lectures)	First order equations: Complete integral. General solution. Cauchy problems. Method of characteristics for linear and quasilinear equations. Charpit's method for finding complete integrals. Methods for finding general solutions.	15
	Second order equations: Classifications. Reduction to canonical forms. Characteristic curves.	10
2 nd Incourse (25 Lectures)	Boundary value problems: Boundary value problems related to linear equations. Applications of Fourier methods (Coordinate systems and separability, Homogeneous equations, Nonhomogeneous boundary conditions, Inhomogeneous equations.)	10
	Problems involving symmetry: Problems involving cylindrical and spherical symmetry, Boundary value problems involving special functions.	10
	Transform methods for boundary value problems: (Applications of the Laplace transforms; applications of Fourier sine and cosine transforms). Inhomogeneous equations.	10
TEST (10 Lectures)	Revision	10

Books Recommended :

1. J. N. Sneddon- *Elements of Partial Differential Equations*.
2. J. M. Kar – *Partial Differential Equations*.
3. B. Epsteim - *Partial Differential Equations*.
4. Schaum's outline Series - B. Epsteim - *Partial Differential Equations*.

4th Year Honours (2014-2015)

Paper Code: 243711

Paper Title: Hydrodynamics

Marks-100, 4 credits, (60 Lectures)

Examination	Course Content	Lectures
1st Incourse (25 Lectures)	Velocity and acceleration of fluid particles. Relation between local and individual rates. Steady and unsteady flows. Uniform and nonuniform flows. Stream lines. Path lines. Bernoulli's equations and its application.	10
	Rotational and irrotational flows, velocity potential vorticity and, vortex lines. Equation of continuity in spherical and cylindrical polar coordinates. Boundary surfaces.	7
	Euler's equation of motion. Conservative field of force. Lamb's hydrodynamical equations of Motion. Motion under conservative body force. Vorticity equation(Helmholtz's vorticity equation)	8
2nd Incourse (25 Lectures)	Motion in two-dimensions. Stream function. Physical meaning of stream function. Velocity in polar-Coordinates. Relation between stream function and velocity potential.	4
	Circulation and vorticity. Relation between circulation and vorticity. Kelvin's circulation theorem, Kelvin's minimum energy theorem. Generalized Joukowski's transformation. Elliptic coordinates and its application.	4
	The circle theorem. Motion of a circular cylinder. Pressure at any point on a circular cylinder. Application of circle theorem. Blasius theorem.	5
	Sources, sinks and doublets. Complex potential and complex velocity. Stagnation points. Complex potential due to sources and doublets, Image in two and three dimensions. Stoke's stream function.	5
	Vortex motion. Complex potential due to vortex motion.	3
	Wave motion. Mathematical representation of wave. Surface wave, Canal wave, Long wave.	4
TEST (10 Lectures)	Revision	10

Books Recommended :

1. L. M. Milne, Thomson - *Theoretical Hydrodynamics*.
2. F. Chorlton - *A Text Book of Fluid dynamics*.
3. P. P. Gupta - *Hydrodynamics*.



4th Year Honours (2014-2015)

Paper Code: 243713

Paper Title: Discrete Mathematics

Marks-100, 4 credits, (60 Lectures)

Examination	Course Content	Lectures
1 st Incourse (25 Lectures)	Mathematical reasoning: Inference and fallacies. Methods of proof. Recursive definitions. Program verification.	8
	Combinatorics: Counting- principles. Inclusion-exclusion principle. Pigeonhole principle. Generating functions. Recurrence relations. Applications to computer operations.	8
	Algorithms and their efficiency : Searching algorithms. Sorting algorithms. Bin packing algorithms. Algorithms on integer operations. Recursive algorithms.	9
2 nd Incourse (25 Lectures)	Graphs: Structure and symmetry of graphs, adjacency matrix, Trees and connectivity. Eulerian and Hamiltonian graphs Diagraphs. Directed graphs. Planar graphs.	9
	Algorithms on graphs : Introduction to graphs, paths and trees. Shortest path problems (Dijkstra's algorithm, Floyd-Warshall algorithm and their comparisons). Spanning tree problems. (Kruskal's greedy algorithm, Prim's greedy algorithm and their comparisons).	8
	Network flows: Flows and cuts. Flow augmentation algorithms. Application of max-flow min-cut theorem.	8
TEST (10 Lectures)	Revision	10

Books Recommended :

1. Schaum's Outline Series – *Discrete Mathematics*.
2. Kenth H.Rosen – *Discrete Mathematics and it's Application*.
3. Fazlur Rahman - *Discrete Mathematics*.
4. C.I. Liu - *Discrete Mathmatics*.

4th Year Honours (2014-2015)

Paper Code: 243715

Paper Title: Astronomy

Marks-100, 4 credits, (60 Lectures)

Examination	Course Content	Lectures
1 st Incourse (25 Lectures)	Sphere and spherical triangles. (Celestial sphere) Astronomical Co-ordinate systems. Conversion of Coordinates system .	10
	planetary motion, Keplar's laws. Equation of time. Unit of time.	15
2 nd Incourse (25 Lectures)	Astronomical refraction, Aberation	8
	Parallax (Geocentric annual) Precession and nutation	8
	Eclipses. Solar System. Stellar astronomy.	9
TEST (10 Lectures)	Revision	10

Books Recommended :

1. S.K. Bhattacharjee, *A Text Book of Astronomy*
2. K.K. Dey –Astronomy
3. Tod Hunter – *Spherical Trigonometry*
4. J.M. Kar – *Astronomy*
5. A.F.M. Abdur Rahman – *A Text Book of Modern Astronomy..*
6. Kvj x C` `vm –Astronomy
7. M. L Khanna – *Spheriacal Astronomy.*

8.

Paper Code	243717	Marks: 100	Credits: 4	Class Hours: 60
Paper Title:	Mathematical Modeling in Biology			

Continuous population models for single species: Continuous growth models. Malthusian model, Logistic model, Delay models. Periodic fluctuations. Harvesting models.

Discrete population models for single species: Simple models. Discrete logistic models. Discrete delay models. Fishery management models

Continuous models for interacting populations: Predator-prey models. Lotka-Volterra systems. Complexity and stability. Periodic behavior. Competition Models. Mutualism, war models.

Discrete growth models for interacting populations: Predator-prey models. Competition models.

Epidemic models and dynamics of infectious diseases: Simple epidemic models (SI model, SIS model, SIR model) and practical applications. (HIV/AIDS model), control of epidemic model.

Books Recommended :

1. J. C. Frauenthal : *Introduction to Population Modeling*.
2. 'D.N. Burghes and M.S. Bowie: *Modeling with Differential Equations*.
3. J.D. Murray : *Mathematical Biology*.
4. Fazlur Rahman – *Mathematical Modeling in Biology*.

4th Year Honours (2014-2015)

Paper Code: 243718

Paper Title: Math Lab (Practical)

Marks-100, 4 credits, (60 Lectures)

Course Content	Lectures
Using Mathematica: Geometry , Linear Algebra, Calculus, Vector calculus, Complex Analysis, Numerical Analysis, Ordinary differential Equation, Methods of Applied Mathematics.	30
Using Fortran: Numerical Analysis, Complex Analysis, Linear Programming.	30

Evaluation: Internal Assessment (Laboratory works): 30 marks

Final Exam (Lab 3 hours): 70 marks.

Paper Code	243720	Marks: 100	Credits: 4	Class Hours: 60
Paper Title:	Viva- Voce			

RvZxq vekje`vj q

RvZxq vekje`vj q AvBb, 1992-Gi 46 bs aviv tgvZvteK c`vZ
e`vPj i (Abvm) wvM0 mstkwaZ ti_tj kb 2009-2010

Bachelor of Honours Degree (Revised) Regulation 2009-2010

tM0vs I tpmWU c`vZ Abhvqx

(2009-2010 wk`vvel`et`_tK KvHki)

1. tc0M0gi tgv`

(K) RvZxq vekje`vj tqi Aaxtb e`vPj i (Abvm) wvM0 tc0M0g c0ZwU welq 4 eQi tgv` mgvSZ tKvm`
(Integrated Course) wntmte weteiPZ nte|

(L) tKvm`mgtK PviwU GKvWugK etl`ef3 Kti cW`vb m`ubdKiv nte, thgb: 1g el`2q el`3q el`4 4`el`

(M) GB tc0M0gi wk`vvel`ete Rj vb-Rp| msk-0 wltqi wntj evm Abhvqx c0Z wk`vvel`et`Kvm`iia: ci_t`_tK tgvU 30
mBvn cv`vb, 4 mBvn cix`vvi c0Z, 6 mBvn eml`R cix`vvi KvHug Pj`te| Aemk0 mtgtqi gta` cix`vvi djvdj
cKvk Kiv nte| c0Z etl`P cix`vvi tkl nqv 2 mBvn ci cieZ`etl`P Kvm`iia nte Ges G Rb` QvT-QvT`xt`i`K
Ktj`R bZb etl`P Rb` c0ekbvj QvT wntmte Zvuj Kvfv3 ntZ nte|

(N) ewl`R tKvm`wfvEK cix`vvi Ges tM0vs I tpmWU c`vZ tZ GB tc0M0g cwiPvuj Z nte| tM0vs I tpmWU
c`vZ tZ wRvcG (GPA) I wvRvcG (CGPA) wntmte cix`vvi djvdj cKvk Kiv nte|

2. wvM0 (Abvm) tc0M0g I velqmgv

D3 tc0M0g wltq wfvEK PviwU kvLvq e`vPj i Abvm`tc0M0g h`vvtg e`vPj i Ae AvUf (weG) Abvm`
e`vPj i Ae tmkvj mvtqY (weGmGm) Abvm`e`vPj i Ae weRt`m GWugvbtmUkb (weveG) Abvm`Ges e`vPj i
Ae mvtqY (weGmm) Abvm`wvM0 c0vb Kiv nte| wefvbe`vPj i (Abvm) tc0M0gi A`S`F3 velqmgv
wb`si`fc:

(K) weG (Abvm) (Bachelor of Arts)

- 1) evsjv
- 2) Bs`i Rx
- 3) Av`i ex
- 4) cvvj
- 5) ms`_Z
- 6) BvZnvm

- 7) `k0
- 8) Bmjvqx wk`vvi
- 9) Bmjv`gi BvZnvm I ms`_vZ
- 10) jvBte`x I Z`_ we`Avb
- 11) we.GW

(L) weGmGm (Abvm) (Bachelor of Social Science)

- 1) A`_BvZ
- 2) iv0te`Avb
- 3) mgvRKg`
- 4) mgvRwe`Avb
- 5) b`_we`Avb

(M) weveG (Abvm) (Bachelor of Business Administration)

- 1) e`e`_vcbv
- 2) wvmeve`Avb
- 3) gv`K0Us
- 4) wclb`vY G0 e`vsvKs

(N) weGmm (Abvm) (Bachelor of Science)

- 1) imvqb
- 2) c`_v`_we`Avb
- 3) MubZ
- 4) cwi msL`vb
- 5) Dv`M`c we`Avb
- 6) c0wY we`Avb
- 7) c0Y imvqb
- 8) f`Mvj I cwi`tek
- 9) cwi`tek we`Avb
- 10) gtbwwe`Avb
- 11) gv`EKv we`Avb
- 12) Mvn`_r A`_BvZ
- 13) Kwe`uDUvi we`Avb

3. fvZ` thM`Zv

(K) evsjv`iki tKvb wk`vvi tev`W`P D`P gva`wgK/Avuj g ev`_k weta`iki mggv`bi cix`vvi cvk Kiv wk`vvi`fv
vekje`vj q KZ`R wba`vi Z wbgq-Kvbp I kZ`Abhvqx e`vPj i (Abvm) tc0M0g c`vZv`x QvT/QvT`x wntmte RvZxq

weklje`vj`iqi Awafjß Ktj`R fuz`ntZ cvite|
 (L) wekje`vj`iqi fuz`P kZ`ewj ci`Y Ktj Ges msik-ó welq/BDwb`Ui fuz`cix`lvq KZKvh`ntj wkv`lv`RvZxq
 wekje`vj`iqi Awafjß Ktj`R/cúZótb tgav t`v`i i wfv`ÉtZ fuz`ntZ cvite|

4. tiw`Rtók b

(K) cY`Rvj`xb Ov`T/Ov`Tx wntmte wekje`vj`iqi wbgqwb`hvqx GKRB wkv`lv`x`Kej gv`G KúU wltq fuz`ntZ cvite|
 (L) GKRB wkv`lv`x`K mte`P 6 (Oq) wkv`lv`e`l`P gta` e`v`Pj i Ae Abvm`Kvm`m`ú`b`K`ti wM`M` AR`B KtjZ nte|

5. welq cwieZ`B

fuz`ntZ qvi ci welq cwieZ`B B`QK wkv`lv`P RvZxq wekje`vj`iq KZ`K wba`wi Z mgqm`xvi gta` e`v`Pj i (Abvm`P wM`M`
 welq cwieZ`B KtjZ cvite| G Rb` Zv`K fuz`KZ wltqi wefv`Mxq cávb l cwieZ`B B`QK wltqi wefv`Mxq cávb t`i
 mpcwi kmn Aa`t`ji gva`tg RvZxq wekje`vj`iqi tiw`R`i eivei wba`wi Z di`g Avt`b KtjZ nte| welq cwieZ`B i
 Rb` wba`wi Z wd Ktj`R KZ`K wekje`vj`iq Rgv`w`tq Abgv`Z w`b`Z nte|

6. cpt fuz`

GKRB wkv`lv`x`i mKj Z`É`xq/e`enwii K/Bb`-t`Kvm`P`gv`VKg`P`Kvm`P l tgs`wLK cix`lvq AskM`h`Y eva`Zvgj`K| cix`lvq
 AskM`h`Y e`_`wkv`lv`P Ges dj`vd`j AKZKvh`cix`lv`x`c`dj`vd`j cK`v`ki 1 (GK) gv`mi gta` cpt fuz`ntZ cvite|
 Df`q t`q`j`t`B Zv`iv Awbqwg`Z wkv`lv`P wntmte MY` nte| GKRB wkv`lv`x`GKB etl`GK`et`i tekx Ges c`j`iv t`Kt`m`P
 t`g`v`t` `v`v`i i tekx cpt fuz`P m`h`wM c`te`bv| cpt fuz`P t`q`j`t` Zvi c`te`P tiw`Rtók b b`e`f enj`_`v`Kte|

7. t`Kv`m`P l t`m`WU-N`b`Uv (Courses & Credit-hour)

t`m`WU Avl`qv`i i wfv`ÉtZ t`Kvm`P`g`a cwi`P`w`j Z nte| cúZ m`b`v`n cv`v`v`bi Rb` e`w`qZ Kvm N`b`Uv`K t`m`WU wntmte
 MY` Kiv nte| Z`É`xq t`Kvm`P`g`t`ni Rb` 45 wgv`b`t`Ui GKúU Kvm`t`K GK Kvm N`b`Uv aiv nte| Ges 15 (c`t`bi) Kvm
 N`b`Uv`K 1 (GK) t`m`WU wntmte MY`bv Kiv nte|

Z`É`xq l e`enwii K t`Kv`m`P Rb` w`b`tg`æ`w`Z Kvm N`b`Uv Ab`j`ni Y Kiv nte|

K) Z`É`xq t`Kvm`P (Theoretical Course):

100 b`e`f t`Kv`m`P 60 Kvm-N`b`Uv (Class Hour) = 4 t`m`WU|
 50 b`e`f t`Kv`m`P 30 Kvm-N`b`Uv (Class Hour) = 2 t`m`WU|

L) e`enwii K/gv`WKg`P`Kvm`P e`enwii K/gv`WKg`P`Kv`m`P Rb` w`b`tg`æ`w`Z Kvm N`b`Uv Ab`j`ni Y Kiv nte|

100 b`e`f i 30 wU e`enwii K K`v`mi Rb` (30 × 3) = 90 Kvm-N`b`Uv = 4 t`m`WU|
 50 b`e`f i 15 wU e`enwii K K`v`mi Rb` (15 × 3) = 45 Kvm-N`b`Uv = 2 t`m`WU|

cúZ wU t`Kv`m`P Rb` m`b`v`n 3 Kvm N`b`Uv (45 × 3) ev 135 wgv`b`t`Ui 2wU e`enwii K Kvm Ab`j`o`Z nte|

M) tgs`wLK cix`lv`

100 b`e`f i tgs`wLK cix`lv` = 4 t`m`WU
 50 b`e`f i tgs`wLK cix`lv` = 2 t`m`WU

8. t`c`ú`w`g wfv`É`K t`m`WU l b`e`f e`Ub (2013-14 wkv`lv`e`l`P`_`t`K Kvh`R`i)

- K) i) w`G (Abvm`P) t`gv`U 3100 b`e`f (3000 b`e`f A`_`v`P 120 t`m`WU + 100 b`e`f B`st`i`R`x`b`b t`m`WU)|
- ii) w`Gm`Gm (Abvm`P) t`gv`U 3100 b`e`f (3000 b`e`f A`_`v`P 120 t`m`WU + 100 b`e`f B`st`i`R`x`b`b t`m`WU)|
- iii) w`w`G (Abvm`P) t`gv`U 3100 b`e`f A`_`v`P 124 t`m`WU|
- iv) w`Gm`m (Abvm`P) t`gv`U 3300 b`e`f (3200 b`e`f A`_`v`P 128 t`m`WU + 100 b`e`f B`st`i`R`x`b`b t`m`WU)|

i) Bachelor of Arts (B.A) (Honours) Degree

el`	m`e`f`b Z`É`xq t`Kvm`P b`e`f	Ab`j`n`x Z`É`xq t`Kvm`P b`e`f (Allied)	B`st`i`R`x eva`Zvgj`K bb`-t`m`WU	t`g`wLK	`v`axb evs`j`v`t`i`k`i Af`-`t`q`i B`v`Z`n`v`m	t`gv`U b`e`f	t`gv`U t`m`WU
1g	400	100		--	100	600	24

2q	400	200	100	--	--	600 +100	24
3q	800	--		--	--	800	32
4_©	900	--		100	--	1000	40
ጎግህ	2400	400	100	100	100	3100	120

ወደ ስፔሻላይዥን ፋኩልቲ ወይንም 100 ኦቶ ስፔሻላይዥን ፋኩልቲ ላይ ለመገባት ለደህረት 3 ወይንም ጎግህ 3000 ኦቶ ለ 120 ጠቅላይ ገቢ

ii) Bachelor of Social Science(B.S.S) (Honours) Degree

የግንባታ ደረጃ	ጠቅላይ ገቢ (ፋኩልቲ)	ጠቅላይ ገቢ (ግንባታ)	ፋኩልቲ ገቢ	ጠቅላይ ገቢ	ጠቅላይ ገቢ	ጠቅላይ ገቢ	ጠቅላይ ገቢ
1g	400	100		--	100	600	24
2q	400	200	100	--	--	600 +100	24
3q	800	--		--	--	800	32
4_©	900	--		100	--	1000	40
ጎግህ	2400	400	100	100	100	3100	120

iii) Bachelor of Business Administration (B.B.A) (Honours) Degree

የግንባታ ደረጃ	ጠቅላይ ገቢ (ፋኩልቲ)	ጠቅላይ ገቢ (ግንባታ)	ፋኩልቲ ገቢ	ጠቅላይ ገቢ	ጠቅላይ ገቢ	ጠቅላይ ገቢ
1g	500		--	100	600	24
2q	700		--	--	700	28
3q	800		--	--	800	32
4_©	900		100	--	1000	40
ጎግህ	2900		100	100	3100	124

iv) Bachelor of Science (B.Sc) (Honours) Degree

የግንባታ ደረጃ	ጠቅላይ ገቢ (ፋኩልቲ)	ጠቅላይ ገቢ (ግንባታ)	ፋኩልቲ ገቢ	ጠቅላይ ገቢ	ጠቅላይ ገቢ	ጠቅላይ ገቢ	
1g	300	150+150 = 300	-	-	100	700	28
2q	400	100+100+100=300	100	-	-	700	28
3q	800	150+150 = 300	-	-	-	800	32

DĒicĭ b=ġi i wġwĒĒZ gġ'vqb Kiv nġel GKRb cixġlv_ġ ZĒġq, e'enwii K l tġsġLK cixġlvq cġB b=ġġK tġUvi tġW (Letter Grade) l tġW cġqġU (Grade Point) iġcġSġ Kiv nġel cixġlv_xġ djvdġ gġ'vqġbi Rb' wbgġ wLZ tġUvi tġW l corresponding tġW cġqġU _vKġel wġkġe'ġġ q gġġx Kġgkb KZġ cġE AwġbġtMġW's c×wZ Abġvġq MwYwZK (numerical) b=ġ, tġUvi tġW l tġW cġqġU nġe wbgġc:

Numerical Grade	Letter Grade (LG)	Grade Point (GP)
80% or above	A+ (Plus)	4.00
75% to less than 80%	A (Plain)	3.75
70% to less than 75%	A- (Minus)	3.50
65% to less than 70%	B+ (Plus)	3.25
60% to less than 65%	B (Plain)	3.00
55% to less than 60%	B- (Minus)	2.75
50% to less than 55%	C+ (Plus)	2.50
45% to less than 50%	C (Plain)	2.25
40% to less than 45%	D (Plain)	2.00
<40% (less than 40%)	F (Fail)	0.00

cġk b=ġ

tġvġmġ b=ġ	100 (4 tġwWU)	50 (2 tġwWU)
cġm b=ġ	40	20
MYbġhġM' tġwWU	D	D

14. DĒYġMġ

Qvġ-Qvġġ' i mġj wbaġi Z tġvġmġ(ZĒġq l e'enwii K) Ges tġsġLK cixġlvq AskMġY eva'Zvgġ K l Qvġ-Qvġġ' i tġK mġj wbaġi Z tġvġmġ tġsġLK cixġlvq 40% ev D tġW ev tġW cġqġU 2 tġq cġk KġZ nġel th mġj tġvġmġD ev Z' aġġtġMġ AwġZ nġe i'agvġ tm tġvġmġtġjvi tġwWU djvdġtġi MYbġq Avbġ nġel Non-Credit Bġti Rx wġlġqi cġB tġW GPA MYbġq tġqġ nġe bġ

15. wġicġ (GPA) Ges wġiġicġ (CGPA) wġYġ

wġw' ġ tġvġmġcġB tġW cġqġU tġK D³ tġvġmġ tġwWU ġviv _Y Kġi G tġvġmġAwġZ cġqġU (EPS) wbaġY Kiv nġel D³ eġġi mġj tġvġmġAwġZ tġvU cġqġU tġvU AwġZ tġwWU ġviv fġM Kġi GK eġġi wġicġ (GPA) wġi'cb Kiv nġel Gfġte mġj eġġi AwġZ tġvU cġqġU mġnġK thġM Kġi mġġvU AwġZ tġwWU ġviv fġM Kġi wġiġicġ (CGPA) wbaġY Kiv nġel D Gi bġtġ cġB tġWwġi Rb' tġvġ tġwWU AwġZ nġe bġ Ges Zv F (Fail) tġW eġġ wġġePZ nġel F tġW tġġK D'PZi tġW Dġz nġġ AwġZ tġwWU CGPA MYbġq ġġ³ nġel F tġW D'PZi tġW Dġz Kġġ cieZxġZ ġġtġvġqġbi Avi mġhġM _vKġe bġ

wġicġ MYbġi c×wZ t

$$GPA = \frac{\sum PS \text{ (Total Point Secured in a year)}}{\sum CR \text{ (Total Credits offered in a year)}}$$

Example: Grade Point Average (GPA) Calculation for a year

Course Code No	No. of credits	Marks Obtained (%)	Letter grade (LG)	Earned Grade points (EGP)	Earned Points Secured (EPS)= No of Credits X Grade Point
2011	4	70	A-	3.50	14.00

2012	4	65	B+	3.25	13.00
2013	4	60	B	3.00	12.00
2014	4	34	F	0.00	00.00
2015	4	55	B-	2.75	11.00
2016	2	50	C+	2.50	05.00
2017	4	45	C	2.25	09.00
Total	26	-	-	-	64.00

Total Point Secured (TPS) = 64

Earned Credit (EC) = 22(4+4+4+0+4+2+4=22)

SGPA = TPS/EC = 64/22 = 2.90

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$$CGPA = \frac{ETPS \text{ of } (1st \text{ year} + 2nd \text{ year} + 3rd \text{ year} + 4th \text{ year}) + \text{Earned Grade Point/Points}}{\text{Total number of credits completed in the whole programme}}$$

16. D'PZi tkYxZ c0gvkb (1g el0tZ 4_0e1I)

- K) tMNs cxiZi m0yb cixlvq BA, BSS Ges BBA Gi t1t1 1g el0tZ 2q e1c0gvkbi Rb Kgc1q 3u ZExq tKvtm0bZg D tMW tctZ nte| 2q el0tZ 3q e1c0bZg 3u ZExq tKvtm0D tMW tctZ nte| 3q el0tZ 4_0e1I c0gvkbi Rb b0Zg 4u ZExq tKvtm0D tMW tctZ nte| B.Sc Gi t1t1 1g el0tZ 2q e1c0gvkbi Rb b0Zg 3u ZExq tKvtm0bZg D tMW tctZ nte| 2q el0tZ 3q e1c0gvkbi Rb b0Zg 3u ZExq tKvtm0bZg D tMW tctZ nte| 3q el0tZ 4_0e1I c0gvkbi Rb b0Zg 4u ZExq tKvtm0bZg D tMW tctZ nte|
- L) 1u tKvtm0AbcwZ t1t1 1k0v0Abvb mKj tKvtm0AskM0Y Kti b0ct1q mKj tKvtm0D tMW tctj cieZ0e1I c0gvkb cte| cieZ0e1I Abj0Z cixlvq AbcwZ w0tq AskM0Y Kti b0Zg D tMW AR0 KiZ nte|
- M) GKRb 1k0v00Kvb e1I 0K -উপধারায় উল্লিখিত তদীয় কোর্সে প্রমোশনের জন্য ন্যূনতম গ্রেড পয়েন্ট অর্জনে ব্যর্থ হলে সে Not Promoted nte| cieZ0e1I Abj0Z D3 e1I cixlvq 1k0v00K ce0Z0e1I cvmKZ ZExq tKvtm0 cixlvq w0tZ nte b| GKB e1I ci Abj0Z 0e1I c0B djvdj K -Dcavi kZ0ciY Kij GKRb 1k0v00K cieZ0e1I c0gvkb cte| Zte c0hvR t1t1 cieZ0e1I c0gvkb cvlqvi ci w0qgvymti tMW Db0Z Kivi m0hvM 1Kte|
- N) GKRb 1k0v00K -Dcavi kZ0ciY m0ct1q 1g el0tZ 2q e1c0gvkb cte 2q e1c0Aa0biZ Ae0vq 1g e1I F tMW mg0tK D'PZi tMW Db0Z Kivi m0hvM cte| Zte 2q e1I cixlvq c0gvkbi Rb K -Dcavi b0Zg kZ0ciY KiZ nte| D3 kZ0ciY e0tj 3q e1c0gvkb cte b| GKB f0te 3q e1c0Aa0biZ Ae0vq c0hvR t1t1 1k0v00K 1 2q e1I F tMW mg0tK D'PZi tMW Db0Z Kivi m0hvM cte| Zte 3q e1I cixlvq c0gvkbi Rb K -Dcavi b0Zg kZ0ciY KiZ nte| D3 kZ0ciY tm e0tj 4_0e1I c0gvkb cte b|

17. tKvm0f0EK b0f 0U0

2013-2014 1k0v0e1I 0tZ m0ZK (m0yb) tkYxi mKj t0M0tgi 1g, 2q, 3q l 4_0e1I c0Z0K ZExq tKvtm0 c0Z 100 b0ti gta Bb-tKvm0I Kvm Dcw0Zi t1t1 b0f nte 20 (15+5) Ges ZExq dvBvj cixlvq t1t1 b0f nte 80| c0Z0K e1I Kvm i0a t1t1 15 m0vtni gta c0Z0 tKvtm0 A0aR cv0mPx tkl Kti c0WZ Astki Dci tKvm0K0tK GK0U Bb-tKvm0cixlvq M0Y KiZ nte| GKBf0te cieZ0 15 m0vtni gta cv0mPx evKx A0aR tkl Kti G Astki Dci Avi GK0Umn tgvU 2u Bb-tKvm0cixlvq M0Y KiZ nte| Af0s0xv0te DEi c1 gj0vq Kti Bb-tKvm0I Kvm Dcw0ZiZ c0B tgvU b0ct1I GK Kvc RvZxq w0k0e0 vj0qi ms0k-0 Dc-cixlvq w0q0K Gi w0KU t0Y KiZ nte Ges GK Kvc ms0k-0 w0f0M0q c0v0bi Aw0tm msi0Y KiZ nte| D0j-L0 eZ0v0tB Aa0biZ 2009-10 1k0v0e1I 0f0vZKZ 1k0v00K i Rb 3q l 4_0e1I c0Z0K ZExq tKvtm0 c0Z 100 b0ti gta Bb-tKvm0I Kvm Dcw0Zi t1t1 b0f nte 20 (15+5) Ges ZExq dvBvj cixlvq t1t1 b0f nte 80| 2010-11 l 2011-12 1k0v0e1I 0f0vZKZ 1k0v00K i Rb 2q, 3q l 4_0e1I c0Z0K ZExq tKvtm0 c0Z 100 b0ti gta Bb-tKvm0I Kvm Dcw0Zi t1t1 b0f nte 20 (15+5) Ges ZExq dvBvj cixlvq t1t1 b0f nte 80| 2012-2013 1k0v0e1I 0f0vZKZ 1k0v00K i Rb 1g, 2q, 3q l 4_0e1I c0Z0K ZExq tKvtm0 c0Z 100

- (L) Bb-ikvmtgslk I e'enwi K cixflvq gvb Dbq̄bi tkvb m̄hvM_vKte bv |
- (M) wefvMxq cāvb Aa'iq̄i gva'ig gvb Dbq̄b cixflvq Ask M̄hY'OK w̄kflv_ī i Zvj K̄v dig cjt̄Yi tkl Zwi t̄Li ci ciB RvZxq wek̄je`vj̄t̄i cixflv w̄bq̄s̄t̄Ki K̄t̄Q t̄c̄Y Ki te |

20. w̄w̄M̄c̄ō̄s̄i t̄h̄M̄'Zv m̄gn

- e`v̄t̄P̄ji (Ab̄m̄) w̄w̄M̄t̄c̄t̄Z n̄t̄j GKRb w̄kflv_īK w̄bt̄gē³ kZ̄m̄gn ciY Ki t̄Z n̄te |
- (K) CGPA Gi w̄f̄w̄ē̄t̄Z P̄ov̄š-dj v̄dj cK̄vk Kiv n̄te |
- (L) GKRb w̄kflv_īK m̄Kj ZĒxq/e'enwi K/Uvḡt̄ccvi/gvVKḡc̄ixflvq AskM̄h̄b K̄ti Ae'kB b̄b̄Zg CGPA 2.00 t̄c̄t̄Z n̄te | Ab`vq̄ t̄m̄ D³ t̄c̄M̄t̄g AKZKvh̄ē̄t̄j MY` n̄te |
- (M) c̄ō̄Zw̄ t̄ḡs̄l̄k cixflvq c_ Kfv̄te t̄M̄W c̄t̄q̄U 2.00 AR̄B̄ Ki t̄Z n̄te | tkvb ēt̄l̄t̄ḡs̄l̄k cixflvq c̄ō̄qv̄R̄bxq GP AR̄b̄ e`_ē̄t̄j ti w̄R̄t̄÷k̄t̄bi t̄gq̄v`_v̄K̄v m̄v̄t̄c̄t̄q̄l̄ cieZ̄P̄e`v̄t̄Pi m̄v̄t̄_ t̄ḡs̄l̄k cixflvq Ask M̄h̄t̄Yi m̄hv̄M̄ cv̄te |
- (N) CGPA 3.75 t̄_ t̄K 4.0 c̄ō̄s̄ w̄kflv_ī i Distinction mn Abvm̄w̄w̄M̄ c̄ō̄vb Kiv n̄te hv GKv̄W̄wgK Ūt̄Ȳw̄t̄P̄ D̄t̄j-L_v̄K̄te |
- (O) m̄Kj t̄K̄v̄t̄m̄P̄ (ZĒxq/e'enwi K/ Uvḡt̄ccvi/gvVKḡt̄ḡs̄l̄k) cixflvq Ask M̄h̄Ȳ eva`Z̄iḡj K Ges b̄b̄Zg t̄M̄W c̄t̄q̄U 2.00 ev D t̄M̄W t̄c̄t̄q̄ cv̄k Ki t̄Z n̄te |

21. cvm w̄w̄M̄ō̄t

- K) 1g, 2q, 3q ev 4_ē̄t̄l̄t̄F t̄M̄W cvl̄qv̄ t̄K̄v̄m̄t̄j̄v̄ ti w̄R̄t̄÷k̄b̄ t̄gq̄v̄t̄` (īīǣ t̄_ t̄K̄ Oq w̄kflv̄t̄l̄P̄ ḡt̄a`) Ae'kB D ev D`P̄Zi t̄M̄W̄ Db̄z̄ Ki t̄Z n̄te | Z̄te F t̄M̄W̄ c̄ō̄s̄ t̄K̄v̄m̄c̄ieZ̄x̄Z̄ cixflvi gva'ig Db̄z̄ Kivi t̄q̄t̄i djv̄dj hv̄B̄ t̄nūK̄ bv̄ t̄K̄b̄ GKRb cixflv_x̄m̄t̄ēP̄ B+ হেড এর বেশী প্রাপ্য হবে না। উল্লেখ্য যে, কোন কোর্সে F t̄M̄W̄_v̄K̄t̄j̄ cixflv_x̄ Abvm̄w̄w̄M̄ō̄ cv̄te bv̄ |
- L) t̄īw̄R̄t̄÷k̄b̄ t̄gq̄v̄ t̄k̄t̄l̄ t̄K̄vb̄ cixflv_x̄ḠK̄w̄āK̄ F t̄M̄W̄/mn b̄b̄Zg 100 Credit AR̄B̄ Ki t̄j̄ Z̄v̄t̄K̄ cvm w̄w̄M̄ō̄ c̄ō̄vb Kiv n̄te |
- M) P̄vi eQ̄t̄īi Abvm̄t̄K̄v̄m̄m̄ū̄b̄ē̄K̄ivi ci t̄K̄vb̄ t̄K̄v̄t̄m̄P̄ mn t̄K̄vb̄ Qv̄T̄ CGPA 2.00 t̄c̄t̄q̄_v̄K̄t̄j̄ Z̄v̄t̄K̄ cvm w̄w̄M̄ō̄t̄` qv̄ hv̄t̄e Z̄te t̄K̄vb̄ t̄K̄v̄t̄m̄P̄ cixflvq Absent_v̄K̄t̄j̄ Z̄v̄t̄K̄ t̄K̄vb̄ w̄w̄M̄ō̄ c̄ō̄vb Kiv n̄te bv̄ |

22. Ūt̄Ȳw̄t̄P̄m̄ (Transcripts)

w̄k̄j̄e`vj̄t̄ī w̄bāw̄i Z̄ w̄d̄ cwi t̄k̄va m̄v̄t̄c̄t̄q̄l̄ c̄ō̄Z̄K̄ ēt̄l̄P̄ djv̄d̄t̄j̄i Ūt̄Ȳw̄t̄P̄ c̄ō̄vb Kiv n̄te | GKv̄W̄wgK Ūt̄Ȳw̄t̄P̄- t̄M̄W̄, Corresponding t̄M̄W̄ c̄t̄q̄U GPA, CGPA t̄` qv̄ n̄te Ges Ḡt̄Z̄ t̄K̄vb̄ M̄w̄Ȳw̄Z̄K̄ b̄x̄t̄_v̄K̄te bv̄ |

(c̄ō̄d̄mi W. d̄īKi īnd̄K̄j̄ Av̄j̄g)
 W̄xb̄ (f̄vi c̄ō̄s̄)
 K̄w̄i K̄j̄ v̄g Db̄q̄b̄ I ḡj̄`v̄q̄b̄ t̄K̄>`^a
 R̄v̄Z̄x̄q̄ w̄k̄j̄e`vj̄q, M̄v̄R̄x̄j̄
 t̄c̄v̄bt̄ 9291030 (Āw̄dm̄) |

**National University
Bachelor of Honours Courses**



**According to new curriculum (Grading & Credit System)
(Questions will be set from recommended textbooks)
Distribution of Marks in Question Paper
Effective from: Session 2013-14
For 1st Year Honours Course**

Full Marks: 75

Time of Examination: 3 Hours

Question Types		Details	
Part-A	Shortest Questions (such as definition/ Quizes) (Covering all the chapters of the syllabus.)		
Part-B	Short Questions (such as Conceptual/Numerical) (Covering all the chapters of the syllabus.)		
Part-C	Broad Questions (such as Analytical/Conceptual/Numerical)		
		Final Exam:	
In course Test will be conducted by the course teacher as per the instruction of the ordinance.			
		Total	75

**According to new curriculum (Grading & Credit System)
(Questions will be set from recommended textbooks)
Distribution of Marks in Question Paper
Effective from: Session 2013-2014
For 1st, 2nd, 3rd & 4th Year Honours Course**

Full Marks: 100

Time of Examination: 4 Hours

Question Types		Details	
Part-A	Shortest Questions (such as definition/ Quizes) (Covering all the chapters of the syllabus.)	10 questions out of 12 1(a-l).	(1×10)=10
Part-B	Short Questions (such as Conceptual/Numerical) (Covering all the chapters of the syllabus.)	5 Questions Out of 8 Question no. 2 -9.	(4×5)=20
Part-C	Broad Questions (such as Analytical/Conceptual/Numerical)	5 Questions Out of 8 (Question may be divided into. (i),(ii),(iii) etc subsections.) Question no. 10 -17.	(10×5)=50
		Final Exam:	80
In course Test will be conducted by the course teacher as per the instruction of the ordinance.			
		Total	100

**According to new curriculum (Grading & Credit System)
(Questions will be set from recommended textbooks)
Distribution of Marks in Question Paper
Effective from: Session 2013-2014**

For 1st, 2nd Year Honours Course

Full Marks: 50

Time of Examination: 2.5 Hours

Question Types		Details	
Part-A	Shortest Questions (such as definition/ Quizes) (Covering all the chapters of the syllabus.)	8 questions out of 10 such as question number 1. (a) – (h)	(1x8)=8
Part-B	Short Questions (such as Conceptual/Numerical) (Covering all the chapters of the syllabus.)	3 Questions Out of 5 such as question number 2 – 6.	(4x3)=12
Part-C	Broad Questions (such as Analytical/Conceptual/Numerical)	2 Questions Out of 4 (Question may be divided into (i),(ii),(iii) etc subsections) For mathematical/numerical questions this condition may be relaxed Questions no. 7 -10.	(10x2)=20
		Final Exam.	40
In course Test will be conducted by the course teacher as per the instruction of the ordinance.			10
		Total	50

Department Of Mathematics Course Distribution

Teacher's name	1H	2H	3H	4H	MF	MP	1P
MH	****	****	Real Analysis	****	Theory of Numbers	****	****
SA	****	****	****	Partial Differential equations	Differential and Integral Equations	Computer Techniques	****
KR	****	****	****	Topology & Functional Analysis	Lattice Theory	Real Analysis	****
NI	****	****	Mechanics	Hydrodynamics	Differential and Integral Equations	Hydrodynamics	****
AB	****	****	Complex Analysis	Astronomy	Theory of Relativity	****	****
AA	****	****	Abstract Algebra	****	Fluid Dynamics	Modern Algebra	****
AZ	Linear Algebra	Computer Programming	Linear Programming	****	****	Linear Programming	****
MR	Analytic and Vector Geometry	****	****	Discrete Mathematics	****	Complex Analysis	Fundamentals of Mathematics
SJ	Fundamentals of Mathematics	Calculus –II (NM)		Theory of Numbers	****	****	****
SH	Fundamentals of Mathematics(NM)	Ordinary Differential Equations	****	****	****	Mechanics	****
NN	Calculus – I(NM)			Tensor Analysis	****	Modern Algebra	Fundamentals of Mathematics
LK	Calculus – I	Calculus –II	Differential Geometry	****	****	****	****
MM	Fundamentals of Mathematics(NM)	****	Numerical Analysis	Methods of Applied Mathematics	****	****	****

Class Rutine-2015								
DAY	2	3	4	5	6	7	8	9
	8:00-9:00	9:00-10:00	10:00-11:00	11:00-12:00	12:00-1:00	1:00-2:00	2:00-3:00	3:00-4:00
Saturday	MP-402-NI	4H-403-AB MP-402-SH	1H-304-LK 3H-402-AA 4H-403-MR	3H-402-AZ 4H-403-SA MF-304-KR	3H-403-NI	1P-304-MR		
	3HP-SA/SJ				2HP-M2, 2NMP-N2-NI/LK			
Sunday	1NM-402-SH	4H-403-AB MF-402-MH MP-304-AA	1H-304-SJ 4H-403-NN MF-402-SA	2H-304-SH 3H-402-AZ 4H-403-MM	3H-402-MH MP-403-NN	1P-304-NN		
	4HP-KR/AZ/MR				2HP-M1, 2NMP-NI-AB/AZ/NN			
Monday	2NM-403-SJ 4H-403-MM	2H-304-AZ 3H-403-AA 4H-402-SA	1H-304-MR 3H-403-LK 4H (B47- HEIB)-401	1H-304 -AZ 3H-403-AB MF-402-AA	MF-402 -NI			2P-NN
	2HP-M3, 2NMP-N4-AA/MR				3HP-SA/SJ			
Tuesday	2NM-403-SJ MP-402-AZ	2H-403-LK 4H-304-NN MP-402-KR	1H-304-SJ 3H-403 -MM 4H (B47- HEIB)-401 MP-402-SA	3H-403-LK MF-402-MH 4H-304-NI	MF-402-AB			2P-AB
	2HP-M2, 2NMP-N2-NI/LK				3HP-SA/SJ			
Wednesday	1NM-403-NN	1H (B3- HEIB)-401- 2H-304-SH 4H-402-MR	1H-304-LK 4H-402-SJ MF-403-AA	3H-403-AB MP- 304 -SH 4H-402-KR	3H-403-MH MP-402-MR		3P-304-LK	
	4HP-KR/AZ/MR				2HP-M3, 2NMP-M3-AA/MR			
Thursday	4H-402-KR 1NM-403-MM	1H (B3-HEIB)-401- 4H-402-NI MP-304-SA	1H-304-MR 2H-403-LK 4H-402-SJ	1H-304-AZ 3H- 403-MM MF-402-KR	3H-403-NI MF-402-AB		3P-304-MM	
	4HP-KR/AZ/MR				2HP-M1, 2NMP-NI-AB/AZ/NN			

MH: Md. Musharraf Husain MR. Md. Mizanur Rahman
 SA: Md. Shahidul Alam SJ: Md. Sarwar Jahan
 KR: Md. Kafilar Rahman SH: Shaika Horkil
 NI: Md. Nurul Islam NN: Nadira Nazneen
 AB: Dr. Akhtara Banu LK: Mst. Lailatul Kadri
 AA: Dr. Md. Abdul Aziz MM: Mafruha mustari

AZ: Md. Asaduzzaman

1H = 1st year Honurs	MP = Masters Part-1
2H = 2nd year Honurs	XI (A,B)=Eleventh Class
3H = 3rd year Honurs	XII(A,B)= Twelve Class
4H = 4th year Honurs	2HP= 2nd Year Hons.Practical
3HP=3rd Year Hons.Practical	4HP= 4rth Year Hons.Practical
MF = Masters Final Year	