KOLHAN UNIVERSITY, CHAIBASA

DEPARTMENT OF MATHEMATICS
(For CBCS syllabus M. Sc.)
COMPOSITION OF BOARD OF STUDIES

1. Chairman : Dr. T. C. K. Raman
Head, University Department of Mathematics
Kolhan University, Chaibasa, Mob. No.-9431758090

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Professor, Department of Mathematics,
Ranchi University, RANCHI, Mob. No.-9835347289

3. Dr. D. R. Kuiry (Member)
Associate Professor,
University Department of Mathematics
Kolhan University, Chaibasa. Mob.-9939372565

4. Dr. B. N. Prasad(Member)
Associate Professor & Head, Department of Mathematics,
Jamshedpur Co-operative College, Jamshedpur,. Mob.-9430745882

5. Dr. M. A. Khan(Member)
C. V. C. Kolhan University,Chaibasa.Mob.No.-9234776209

6 . Dr. K.N.Pradhan(Member)
Head, Department of Mathematics,
Tata College, Chaibasa, MobNo.- 7209860187

(Dr.T.C.K.Raman)
Associate Professor & Head, Department of Mathematics
KOLHAN UNIVERSITY ,CHAIBASA.

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Dr. K. N. Pradhan Member	Dr. B. N. Prasad Member	Dr. M. A. Khan Member

10. SEMESTER WISE DISTRIBUTION OF COURSES

10.1 M.Sc. Programme

Table – 1 : Course Structure for M. Sc. Programme

Semesters	Courses	Credit	Hrs./Week
I	FC (Compulsory) – (FC-1)	5	5 (L) + 1 (T)
	Computer Science		
	Core Course – 1 (CC-1)	5	5 (L) + 1 (T)
	Core Course – 2 (CC-2)	5	5 (L) + 1 (T)
	Core Course (P) – 3 [CC (P) – 3]	5	10
II	Elective Course (SE) (EC-1)	5	5 (L) + 1 (T)
	Research Methodology		
	CC – 4	5	5 (L) + 1 (T)
	CC – 5	5	5 (L) + 1 (T)
	CC (P) - 6	5	10
III	CC – 7	5	5 (L) + 1 (T)
	CC – 8	5	5 (L) + 1 (T)
	Elective (GE/DC) (EC -2)	5	5 (L) + 1 (T)
	EC (P) – 3	5	10
IV	CC – 9	5	5 (L) + 1 (T)
	Elective (GE/DC) (EC – 4)	5	5 (L) + 1 (T)
	EC (P) – 5	5	5 (L) + 1 (T)
	Project	5	10
Total Credit		**80**	

Project Work:

The credit for the projects may vary from 4 (Four) to 12 (Twelve) depending on the prescription for the contents and the number of hours assigned to the same. Normal projects would carry 5 (Five) credits with 10 hours per week of time involvement.

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Dr. M. A. Khan
Member

Course Content of Mathematics
Under Choice Based Credit System (CBCS)

Subject: Mathematics

Syllabus Scheme for CBCS in M. Sc.

There will be two Semesters in each year. In third & fourth semesters there are four Elective papers altogether. Among ECMATH302A & ECMATH302B only one is to be opted; similarly among ECMATH303A and ECMATH303B only one is to be opted & among ECMATH404A & ECMATH404B only one is to be opted and finally ECMATH405A & ECMATH405B only one is to be opted.

1st Semester

CCMATH101 100 marks
Real Analysis & Measure Theory

CCMATH102 100 marks
Complex Analysis

CCMATH103 100 marks
Topology

2nd Semester

CCMATH204 100 marks
Group Theory.

CCMATH205 100 marks
Differential Geometry.

CCMATH206 100 marks
Analytical Dynamics.

3rd Semester

CCMATH307 100 marks
Discrete mathematics.

CCMATH308 100 marks
Functional Analysis.

ECMATH302A 100 marks
Computational Technology & FORTRAN

Or

ECMATH302B 100 marks
Differential Equation

ECMATH303A 100 marks
Operations Research

ECMATH303B 100 marks
Difference Equation

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4th Semester

CCMATH409	100 marks
Ring & Field	
ECMATH404A	100 marks
Integral Transform	
or	
ECMATH404B	100 marks
Boundary Layer Theory	
ECMATH405A	100 marks
Partial Differential Equation	
ECMATH405B	
Numerical Method	

PROJECT

Project work of 100 Marks related to elective papers

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UNIVERSITY DEPARTMENT OF MATHEMATICS,KOLHAN UNIVERSITY, CHAIBASA
CBCS PATTERN SYLLABUS W.E.F 2017-2018

1st Semester

CCMATH101 **70 marks**

A total of **EIGHT** questions will be set in which Question No. 1(One) will be Objective Type Question (MCQ/True-False/Fill in the Blanks etc.) consisting 10(Ten) questions of 1(One) mark each and will be COMPULSORY. Any **FOUR** questions shall have to be answered by the examinee out of the remaining **SEVEN** questions carrying 15(Fifteen) marks each.

UNIT I:Real Analysis **Lecture-20** **Question-4**

A1; Sequence and series of function: Uniform convergence of sequence and series of real function. Cauchy's general principle of uniform convergence, continuity of the sum of a series of function. Weiestrass's M-test for uniform convergence. Term by term integration and differentiation.

A2; Fourier series: Fourier series expansion of a function relative to an orthonormal system. Bessel's inequality, pointwise convergence of trigonometric Fourier series, Dirichlet's integral, Perseval's theorem, Riemann-Lebesgue theorem, Problems on finding trigonometric Fourier series representation of periodic functions.

UNIT II:Measure Theory **Lecture-20** **Question-4**

B1: Measure theory: Outer measure, measurable sets through Caratheodory approach, arithmetical properties of measureable sets, two fundamental theorems and examples of uncountable sets of zero measure.

B2: Measurable Functions: Closure of class of measurable function under all algebraic and limit operations, Littlewood's third principle trigonometric Fourier series representation of periodic functions. Function bounded over a set of finite measure, condition of measurability, Lebesgue integral and its arithmetical properties, comparison with R-integral, bounded convergence theorem.

REFERENCE BOOK:

1. Principle of Mathematical Analysis: Walter Rudin
2. Mathematical Analysis: Shanti Narayan
3. Real Analysis: H. L. Royden
4. Advanced Real Analysis: K. K. Jha
5. Measure theory: Gupta & Gupta

CCMATH102 **70 marks**

A total of **EIGHT** questions will be set in which Question No. 1(One) will be Objective Type Question (MCQ/True-False/Fill in the Blanks etc.) consisting 10(Ten) questions of 1(One) mark each and will be COMPULSORY. Any **FOUR** questions shall have to be answered by the examinee out of the remaining **SEVEN** questions carrying 15(Fifteen) marks each.

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Complex Analysis: **Lecture-40** **Question-8**

A1: Integral: Cauchy's integral theorem, Cauchy's integral formula, Morera's theorem, Liouvillies theorem, Taylor's theorem, Laurent's theorem, Rouche's theorem, fundamental theorem of algebra.

A2: Power series: formula for radius of convergence of power series, absolute & uniform convergence theorem of power series, uniqueness theorem of power series, term by term integration and differentiation theorem.

A3; Residue & poles, contour integration and problems

A4: Conformal mapping: Conformal and bilinear mapping, necessary & sufficient condition for conformal mapping, mapping from half plane to circle, mapping from unit circle to unit circle and related problems.

REFERENCE BOOK:
1. Complex Variable: Churchill
2. Theory of Functions: Titch Marsh
3. Complex Analysis: J. B. Conway
4. Function of a Complex Variable: Goyal & Gupta

CCMATH103 **70 Marks**

A total of **EIGHT** questions will be set in which Question No. 1(One) will be Objective Type Question (MCQ/True-False/Fill in the Blanks etc.) consisting 10(Ten) questions of 1(One) mark each and will be COMPULSORY. Any **FOUR** questions shall have to be answered by the examinee out of the remaining **SEVEN** questions carrying 15(Fifteen) marks each.

Topology **Lecture-40** **Question-8**

A1: Compacness in metric space, Ascoli's theorem.

A2: Topological spaces: Definition, examples, base, sub-base, first axiom space, second axiom space, comparison of topologies.

A3; Compactness: Compact space, Lindeloff space, product space, Tychonoff's theorem, locally compactness.

A4; Separation: T_1 – space, T_2 – space, normal & completely regular space, Uryshon's lemma, Tietze extension theorem, Uryshon's metrization theorem.

A5: Connectedness: connectedness & its properties.

REFERENCE BOOK:
1. Complex Variable: Churchill
2. Theory of Functions: Titch Marsh
3. Complex Analysis: J. B. Conway
4. Function of a Complex Variable: Goyal & Gupta

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2nd Semester

CCMATH204 **70 marks**

A total of **EIGHT** questions will be set in which Question No. 1(One) will be Objective Type Question (MCQ/True-False/Fill in the Blanks etc.) consisting 10(Ten) questions of 1(One) mark each and will be COMPULSORY. Any **FOUR** questions shall have to be answered by the examinee out of the remaining **SEVEN** questions carrying 15(Fifteen) marks each.

Group Theory. **Lecture-40** **Question-8**

A1: Isomorphism and homomorphism of groups, isomorphism theorem.

A2: Permutation group & simple group & related topics

A3: Conjugacy classes, normaliser, class equation of a finite group.

A4: Direct products: Direct product of a finite number of groups, necessary & sufficient condition for the isomorphism between the product and the direct product of groups.

A5: Group action orbit stabilizer theorem, Syllow theorem & application in proving non-simplicity for the isomorphism between the product and the direct product of groups

REFERENCE BOOK:
1. University Algebra: N. S. Gopala Krishna
2. A First Course in Abstract Algebra: J. B. Fraleigh
3. First Course in Group Theory: P. B. Bhattacharya

CCMATH205 **70 marks**

A total of **EIGHT** questions will be set in which Question No. 1(One) will be Objective Type Question (MCQ/True-False/Fill in the Blanks etc.) consisting 10(Ten) questions of 1(One) mark each and will be COMPULSORY. Any **FOUR** questions shall have to be answered by the examinee out of the remaining **SEVEN** questions carrying 15(Fifteen) marks each.

Differential Geometry **Lecture-40** **Question-8**

A1: Space curve: Curvature and torsion, Serret-Frenet formulae, helix uniqueness theorem for space curve, the circle of curvature, osculating sphere, locus of centre of curvature, spherical curvature, locus of centre of spherical curvature, Bertrand curve.

A2: Curvilinear co-ordinates on a surface, fundamental magnitudes, direction on a surface.

A3: Curve on a surface: Parametric curves, curvature of normal section, Meusier’s theorem, principal direction & principal curvature, line of curvature, theorem of Euler and Dupin, conjugate direction and asymptotic line.

A2: Geodesics: Differential equation of geodesics via normal properties, geodesics on developable, curvature & torsion of a geodesics.

REFERENCE BOOK:
1. Differential Geometry: C. E. Weatherburn
2. Riemannian Geometry: C. E. Weatherburn

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CCMATH206 **80 marks**

A total of **EIGHT** questions will be set in which Question No. 1(One) will be Objective Type Question (MCQ/True-False/Fill in the Blanks etc.) consisting 10(Ten) questions of 1(One) mark each and will be COMPULSORY. Any **FOUR** questions shall have to be answered by the examinee out of the remaining **SEVEN** questions carrying 15(Fifteen) marks each.

Analytical Dynamics **Lecture-40** **Question-8**

A1: Motion in two dimensions: Motion of C. G. and motion about C. G., K. E. slipping of road, motion of sphere on inclined plane when rolling and sliding are combined, motion of circular disk on a plane and related problems.

A2: Moving axes: Velocity and acceleration in two dimensional motion when the axes are moving, velocity and acceleration in three dimensions when the axes are moving, velocity and acceleration in three dimensional motion in polar form, angular velocity referred to moving axes and Euler's geometrical equation.

A3: Equation of motion and its application in three dimensions: General equation of motion, Euler's equation of motion, momentum of rigid body, moments about instantaneous axes, K. E. of rigid body and related problems.

A4: Lagrange's equation of motion of small oscillation: Generalized co-ordinates, constraints classification of mechanical systems, Lagrange's equation of motion, principle of energy, small oscillation, normal co-ordinates.

REFERENCE BOOK: 1. Rigid Dynamics: P. P. Gupta & G. S. Malik.
2. Dynamics Part-II: A. S. Ramsay

3rd Semester

CCMATH307 **70 marks**

A total of **EIGHT** questions will be set in which Question No. 1(One) will be Objective Type Question (MCQ/True-False/Fill in the Blanks etc.) consisting 10(Ten) questions of 1(One) mark each and will be COMPULSORY. Any **FOUR** questions shall have to be answered by the examinee out of the remaining **SEVEN** questions carrying 15(Fifteen) marks each.

Discrete mathematics. **Lecture-40** **Question-8**

A1: Partially ordered sets, lattices, geometrical lattices, distributive lattices, modular lattice, complemented lattice.

A2: Logic: Boolean algebra, Boolean expression, application to switching circuits.

A3; Graph theory: Degree sum theorem, Eulerian graph and its properties, Hamiltonian graph, trees, planarity of graphs, Euler's theorem on planar graph and application, chromatic number and five colour theorem, marriage theorem, transversal version of marriage theorem, directed graph, Kruskal's algorithm, Dijkastra's algorithm.

A4; Pigeon hole principle, principle of inclusion & exclusion, derangement.

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REFERENCE BOOK: 1. Lattice: K. K. Jha
2. Discrete Mathematics: K. D. Joshi
3. Automata theory-Discrete Mathematics: Tremby & Manohar
4. Graph Theory: R. J. Wilson

CCMATH308 **70 marks**

A total of **EIGHT** questions will be set in which Question No. 1(One) will be Objective Type Question (MCQ/True-False/Fill in the Blanks etc.) consisting 10(Ten) questions of 1(One) mark each and will be COMPULSORY. Any **FOUR** questions shall have to be answered by the examinee out of the remaining **SEVEN** questions carrying 15(Fifteen) marks each.

Functional Analysis. **Lecture-40** **Question-8**

A1; Cauchy's, Minskowski's and Holder's inequalities, normed linear space, Banach space, definition and examples including classic Banach space, sub-space and Quotient space.

A2; Continuous linear maps, $B(N,N^1)$: Dual (conjugate) space of 'N', natural embedding theorem, dual of R_n and I_p operator and its conjugate Riesz lemma.

A3: Hahn-Banach theorem and consequences, open mapping theorem and projection on Banach space, closed graph theorem and uniform boundedness principle.

A4; Hilbert's Space: Definition and examples, Schwartz inequalities, orthogonal completeness characterization, Gram-Schmidt orthogonalization.

REFERENCE BOOK: 1. Function Analysis: J, N, Sharma & A. R. Vashishtha
2. Elements of Functional Study: Soboreve Lusternic

ECMATH302A **70 marks**

A total of **EIGHT** questions will be set in which Question No. 1(One) will be Objective Type Question (MCQ/True-False/Fill in the Blanks etc.) consisting 10(Ten) questions of 1(One) mark each and will be COMPULSORY. Any **FOUR** questions shall have to be answered by the examinee out of the remaining **SEVEN** questions carrying 15(Fifteen) marks each.

Computational Technology & FORTRAN: **Lecture-40** **Question-8**

A1: Introduction to numerical computing, computing concepts, computer codes, arithmetic approximation & error in computing.

A2: Flowchart & programming techniques- flow chart for simple problems, branching, conditional & unconditional jumps, main structure of a high level language, constants, variables, arithmetic & relational expressions, I/O controls, loop structures, array data, Sub – programs, Character handling.

A3: FORTRAN: Need and scope, a sample program, FORTRAN constants, FORTRAN variables, subscripted variables, I/O statements, computation, FORTRAN expression control of execution, if-else, relational expressions, do-while structure, sub-program, function sub-program, subroutine subprogram

A4: Examples of program: (a) Matrix; addition, multiplication and transpose. (b) To find out prime number, odd or even number, GCD, Fibonacci sequence. (c) To convert from Fahrenheit to Celsius. (d) Write any program using subroutine.

REFERENCE BOOK: 1. Numerical Methods: E. Balaguruswamy
2. Introductory Probability & Statistical Application: P.L. Meyer
3. Fundamental of Computer Algorithm: H. Horornitz , S. Sahni et. al.

Or

ECMATH302B **70 marks**

A total of **EIGHT** questions will be set in which Question No. 1(One) will be Objective Type Question (MCQ/True-False/Fill in the Blanks etc.) consisting 10(Ten) questions of 1(One) mark each and will be COMPULSORY. Any **FOUR** questions shall have to be answered by the examinee out of the remaining **SEVEN** questions carrying 15(Fifteen) marks each.

Differential Equation **Lecture-80** **Question-8**

A1: Laplace transform, transform of elementary function, transform of derivative, inverse transform, convolution theorem, application of ordinary and partial differential equation.

A2: Fourier transform, sine and cosine transform, inverse Fourier transform, application to ordinary and partial differential equation.

A3: Series solution of general homogeneous linear second order equation, singular points, the method of Frobenius.

A4: Linear system, linear algebra applied to ordinary differential equation, Eigen value problem, fundamental matrix solution, introduction to stability problem.

REFERENCE BOOK: 1. Integral Transform: A. R. Vashishtha
2. Differential Equation & their application: Martin Braun
3. Elements of ODE & Special Function: A. Chakraborty
4. Advanced Differential Equation: M. D. Raisinghania

ECMATH303A **70 marks**

A total of **EIGHT** questions will be set in which Question No. 1(One) will be Objective Type Question (MCQ/True-False/Fill in the Blanks etc.) consisting 10(Ten) questions of 1(One) mark each and will be COMPULSORY. Any **FOUR** questions shall have to be answered by the examinee out of the remaining **SEVEN** questions carrying 15(Fifteen) marks each.

Operations Research **Lecture-40** **Question-8**

A1: Inventory; Known demand, probabilistic demand, deterministic model and probabilistic model without lead time.

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A2: Project planning and control with PERT-CPM: Rules of network construction, time calculation in networks, critical path method, PERT, PERT calculations, advantages of network (PERT/CPM), difference between CP and PERT

A3: Game theory: Two person, zero-sum games, games with mixed strategies, graphical solution, solution by linear programming.

A4: Integer programming: Branch and bound technique, Gomory's cutting plane method.

REFERENCE BOOK: 1. Operation Research: R. K. Gupta.
2. Introduction to Operation Research: F. S. Hillier & G. L. Lieberman.
3. Operation Research: A. M. Natrajan, P. Balaguruswami, A. Tamilarasi.
4. Operation Research: Kanti Swaroop, P. K. Gupta & Man Mohan.
5. Operation Research: S. D. Sharma.
6. Operation Research: Prem Kumar Gupta & D. S. Hira.

ECMATH303B **70 marks**

A total of **EIGHT** questions will be set in which Question No. 1(One) will be Objective Type Question (MCQ/True-False/Fill in the Blanks etc.) consisting 10(Ten) questions of 1(One) mark each and will be COMPULSORY. Any **FOUR** questions shall have to be answered by the examinee out of the remaining **SEVEN** questions carrying 15(Fifteen) marks each.

Difference Equation **Lecture-40** **Question-8**

A1; Dynamics of first order difference equation, linear first order difference equation, equilibrium points, their stair step (cobweb) diagram, cobweb theorem of economics, criteria for asymptotic stability of equilibrium points, periodic points and cycles, the equation & bifurcation equilibrium-(fixed) points, 2-cycles, 2_2- cycles.

A2: Linear difference equation of higher order: Difference calculus – the power shift factorial polynomials, antidifference operator, general theory of linear difference equation, linear homogeneous equation with constant coefficients, linear variation of parameters, limiting behaviour of solution, application – propagation of annual plans, gambles ruin national income, the transition of information.

REFERENCE BOOK: 1. Introduction to Difference Equation:S. N. Elaydi
2. Difference Equation An Introduction with Application: Kelly & Peterson
3. Difference Equation: D. C. Agarwal
4. Advanced Difference Equations: M. D. Raisinghania

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4th Semester

CCMATH409 **70 marks**

A total of **EIGHT** questions will be set in which Question No. 1(One) will be Objective Type Question (MCQ/True-False/Fill in the Blanks etc.) consisting 10(Ten) questions of 1(One) mark each and will be COMPULSORY. Any **FOUR** questions shall have to be answered by the examinee out of the remaining **SEVEN** questions carrying 15(Fifteen) marks each.

Ring & Field **Lecture-40** **Question-8**

A1: Factorization in integral domain: Concept of divisibility in integral domain, GCD & LCM of two non-zero elements in an integral domain, irreducible and prime elements in an integral domain, relation between prime and irreducible elements, definition and examples of Euclidean domain, principal ideal domain and unique factorization domain, relation between Euclidean domain, principal ideal domain and unique factorization domain, the integral domain Z[I] and K[X] K field properties of Euclidean domain, principal ideal domain and unique A2: factorization domain, Einstein criteria of irreducibility, Gauss's lemma.

Field theory: Extension of a field, finite extension and infinite extension, algebraic extension and transcendental extension, properties of algebraic extension, relation between algebraic and finite extension, splitting field of a polynomial over a field, normal extension, characterization of finite normal extension, separable extension and properties of a separable extension, perfect field and characterization of perfect field, primitive element theorem, finite field and their existence.

REFERENCE BOOK: 1. University Algebra: N. S. Gopalakrishna
2. Advanced Course in Modern Algebra: Goyal & Gupta

ECMATH404A **70 marks**

A total of **EIGHT** questions will be set in which Question No. 1(One) will be Objective Type Question (MCQ/True-False/Fill in the Blanks etc.) consisting 10(Ten) questions of 1(One) mark each and will be COMPULSORY. Any **FOUR** questions shall have to be answered by the examinee out of the remaining **SEVEN** questions carrying 15(Fifteen) marks each.

Integral Transform **Lecture-40** **Question-8**

A1. The Stieltjes integrals: Existence of Stieltjes integrals, properties of Stieltjes integrals, the Stieltjes integral as a series or a Lebesgue integral, normalization, improper Stieltjes integral. laws of the mean, change of variable of indefinite integral, Stieltjes integral as infinite series-second method.

A2. The Laplace- Stieltjes transform: Region of convergence, abscissa of convergence, absolute convergence, uniform convergence.

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A3. Abelian theorem for the Laplace and Stieltjes transform, Tauberian theorems, Tauberian theorems for the Stieltjes transform.

A4. Inversion and representation problems for the Laplace transform, Laplace asymptotic of an integral, application to integrals leading to direct inversion formula, general representation theorem.

REFERENCE BOOK: 1. The Laplace Transform: D. V. Widder
2. The Fourier Transform: I. N. Sneddon

or

ECMATH404B **70 marks**

A total of **EIGHT** questions will be set in which Question No. 1(One) will be Objective Type Question (MCQ/True-False/Fill in the Blanks etc.) consisting 10(Ten) questions of 1(One) mark each and will be COMPULSORY. Any **FOUR** questions shall have to be answered by the examinee out of the remaining **SEVEN** questions carrying 15(Fifteen) marks each.

Boundary Layer Theory **Lecture-40**
Question-8

A1. Derivation of Navier-Stokes equation of motion for a viscous flow, Poiseuille flow through a pipe, plane Couette flow, stagnation point, flow between two concentric rotating cylinders, flow near rotating disk, slow motion, limiting case of large small viscosity, linearization of the Navier-stokes equation by method of Stokes and Oseen.

A2. Boundary layer concept, boundary layer thickness, displacement thickness, derivation of boundary layer equation for flow along a plane and curved wall, Raynold's principle of similarity, similar solutions, boundary layer along a flat plate, a wedge, a circular cylinder and in a convergent channel. A xi-symmetric boundary layer on a body of revolution, boundary layer growth for impulsive start of motion & for uniformly accelerated motion.

A3. The momentum equation for the boundary layer and its application to the flow past a flat place at zero incidence.

REFERENCE BOOK: 1. Boundary Layer Theory: H. Schlichting
2. Modern Development in Fluid Dynamics. Vol-I & II: S. Goldstain

ECMATH405A **70 marks**

A total of **EIGHT** questions will be set in which Question No. 1(One) will be Objective Type Question (MCQ/True-False/Fill in the Blanks etc.) consisting 10(Ten) questions of 1(One) mark each and will be COMPULSORY. Any **FOUR** questions shall have to be answered by the examinee out of the remaining **SEVEN** questions carrying 15(Fifteen) marks each.

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Partial Differential Equation **Lecture-40** **Question-8**

A1: Classification of second order partial differential equation, reduction to canonical forms

A2: Fourier transform, sin & cosine transform ,inverse Fourier transform, application to ordinary & partial differential equation

A3: Wave equation: Derivation and fundamental solution of one dimensional wave equation in Cartesian form, Application problem, one dimensional solution by separation of variables, D'Alembert's solution of wave equation.

A4: Integral transforms and Green's function method of Solution: Solution of PDE using Separation of variables, Fourier transform and by Laplace transform, Green's function and solution of boundary value problems using Laplace transformations

REFERENCE BOOK:
1. Partial Differential Equations-L.C.Evans
2. Partial Differential Equations-P.Prasad & R.Ravindran
3. Partial Differential Equations-K.Shankara Rao
4.AdvanceEngineering Mathematics- E.Kreyszing
5. Use of Integral Transform- I.N.Sneddon

ECMATH405B **70 marks**

A total of **EIGHT** questions will be set in which Question No. 1(One) will be Objective Type Question (MCQ/True-False/Fill in the Blanks etc.) consisting 10(Ten) questions of 1(One) mark each and will be COMPULSORY. Any **FOUR** questions shall have to be answered by the examinee out of the remaining **SEVEN** questions carrying 15(Fifteen) marks each.

Tensor Calculus **Lecture-40** **Question-8**

A1; Tensor algebra- contravariant and covariant vector (tensor of first order), tensor of second order (or of rank 2), the Kronecker delta, the tensor of higher rank, invariant or scalars, addition and subtraction of tensor, contraction, product of tensor, inner product symmetric tensor, generalised quotient law, conjugate or reciprocal symmetric tensor, relative tensors, group property of tensor, related problems

A2; Covariant differentiation, The Christoffel three index symbols, transformation of Christoffel symbol, covariant differentiation of vector, covariant differentiation to tensor, laws of covariant differentiation of tensor. divergence & curl of a vector, intrinsic derivative, derived vector, cross product of two vectors, Ricci's Theorem, related problems.

Reference book:
1. Differential Geometry : C.E. Weatherburn.
2. Riemannian Geometry : C.E. Weatherburn.
3. Tensor Calculus----Schaum's series

PROJECT

Project work of 100 Marks related to elective papers

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