BHARATHIAR UNIVERSITY, COIMBATORE.
B.Sc. Mathematics CA
(Revised papers with effect from 2014-15 onwards)

Note : The revised syllabi for the following papers furnished below be followed and there is no change in the existing scheme of examination and syllabi of remaining papers.

Semester: I - Core Paper- I

Subject title: Classical Algebra **Credit hours-4**
Subject description: This course focuses on the convergence and divergence of different types of series, also discusses the standard methods of solving both polynomial and transcendental type equations.
Goal: To enable the students to learn about the convergence and divergence of the series and to find the roots for the different types of the equation.
Objectives: On successful completion of this course the students should gain knowledge about the convergence of series and solving equations.

UNIT I:
Binomial & exponential theorems (statements only) - their immediate application to summation and approximation only.

UNIT II:
Logarithmic series theorem-statement and proof-immediate application to summation and approximation only. Convergency and divergency of series –definitions, elementary results-comparison tests-De Alemberts and Cauchy's tests.

UNIT III:
Absolute convergence-series of positive terms-Cauchy's condensation test-Raabe's test.

UNIT: IV
Theory of equations: Roots of an equation- Relations connecting the roots and coefficients- transformations of equations-character and position of roots-Descarte's rule of signs-symmetric function of roots-Reciprocal equations.

UNIT V:
Multiple roots-Rolle's theorem - position of real roots of f(x) =0 - Newton's method of approximation to a root - Horner's method.

Treatment as in
Algebra-T.K .Manicavachasam Pillai, T.Natarajan, K-S Canapathy.
S. Viswanatham (Printers & Publishers Private Ltd-2006)

Reference:
1. Mathematics for B.Sc. Branch I -Vol. I- P. Kandasamy and K. Thilagavathy
(For B.Sc-I semester) S. Chand and Company Ltd, New Delhi, 2004.
2. Algebra. -- N.P.Bali- Laxmi publications

Core Paper- II

Subject title: CALCULUS **Credit hours-5**

Subject description:

This course presents the idea of curvatures, integration of different types of functions, its geometrical applications, double, triple integrals and improper integrals.

Goal:

To enable the students to learn and gain knowledge about curvatures, integrations and its geometrical applications.

Objectives:

On successful completion of course the students should have gain about the evolutes and envelopes, different types of integrations, its geometrical application, proper and improper integration.

UNIT I:

Curvature-radius of curvature in Cartesian and polar forms-evolutes and envelopes-pedal equations- total differentiation- Euler's theorem on homogeneous functions.

UNIT II:

Integration of $f'(x)/f(x)$, $f'(x)\sqrt{f(x)}$,$(px+q)/\sqrt{(ax^2+bx+c)}$], [$\sqrt{(x-a)/(b-x)}$],
[$\sqrt{(x-a)(b-x)}$,$1/[\sqrt{(x-a)(b-x)}$,$1/(a\cos x+b\sin x+c)$,
$1/(a\cos^2 x+b\sin^2 x+c)$,Integration by parts

UNIT III:

Reduction formulae- problems- evaluation of double and triple integrals- applications to calculations of areas and volumes-areas in polar coordinates.

UNIT IV:

Change of order of integration in double integral- Jacobions.- change of variables in double and triple integrals.

UNIT V:

Beta and Gamma integrals-their properties, relation between them- evaluation of multiple integrals using Beta and Gamma functions.

Treatment as in

1. Calculus vol 1 and vol 2"-- S. Narayanan and T.K.M. Pillai. Viswanathan Publishers

Reference:

1. Mathematics for BSc – Vol I and. II - P. Kandasamy & K.Thilagarathy S.Chand and Co-2004
2. A Text book of calculus- Shanthi Narayanan & J.N.Kapoor, S.Chand & Co.

Semester: IV - Core paper VIII

Subject Title: Differential Equations and Laplace Transforms Credit Hours: 3
Subject Descriptions:

This course presents the method of solving ordinary differential Equations of First Order and Second Order, Partial Differential equations. Also it deals with Laplace Transforms, its inverse and Application of Laplace Transform in solving First and Second Order Differential Equations with constant coefficients.

Goals: It enables the students to learn the method of solving Differential Equations.

Objectives: End of this course, the students should gain the knowledge about the method of solving Differential Equations. It also exposes Differential Equation as a powerful tool in solving problems in Physical and Social sciences.

Unit I:

Ordinary Differential Equations: Equations of First Order and of Degree Higher than one – Solvable for *p, x, y* – Clairaut's Equation – Simultaneous Differential Equations with constant coefficients of the form

i) $f_1(D)x + g_1(D)y = \phi_1(t)$

ii) $f_2(D)x + g_2(D)y = \phi_2(t)$

where f_1 , g_1 , f_2 and g_2 are rational functions $D = \frac{d}{dt}$ with constant coefficients ϕ_1 and ϕ_2 explicit
functions of *t*.

Unit II:

Finding the solution of Second and Higher Order with constant coefficients with Right Hand Side is of the form Ve^{ax} where *V* is a function of *x* – Euler's Homogeneous Linear Differential Equations.

Unit III:

Partial Differential Equations: Formation of equations by eliminating arbitrary constants and arbitary functions – Solutions of P.D Equations – Solutions of Partial Differential Equations by direct integration – Methods to solve the first order P.D. Equations in the standard forms - Lagrange's Linear Equations.

Unit IV:

Laplace Transforms: Definition – Laplace Transforms of standard functions – Linearity property – Firsting Shifting Theorem – Transform of $tf(t)$, $\frac{f(t)}{t}$, $f^{1}(t)$, $f^{11}(t)$.

Unit V:

Inverse Laplace Transforms – Applications to solutions of First Order and Second Order Differential Equations with constant coefficients.

Treatment as in

Kandasamy. P, Thilagavathi. K "Mathematics for B.Sc – Branch – I Volume III", S. Chand and Company Ltd, New Delhi, 2004.

References:

1) S. Narayanan and T.K. Manickavasagam Pillai, Calculus, S. Viswanathan (Printers and Publishers) Pvt. Ltd, Chennai 1991
2) N.P. Bali, Differential Equations, Laxmi Publication Ltd, New Delhi, 2004
3) Dr. J. K. Goyal and K.P. Gupta, Laplace and Fourier Transforms, Pragali Prakashan Publishers, Meerut, 2000

Semester IV - Skill Based Subject
Subject title - Operations Research – Paper II

Credit hours: 3

Subject Description:

This course gives emphasis to enhance student knowledge in game theory, performance measures of queues, optimal use of Inventory and Network scheduling with application.

Unit I:

Game Theory – Two person zero sum game – The Maxmini – Minimax principle – problems - Solution of 2 x 2 rectangular Games – Domination Property – (2 x n) and (m x 2) graphical method – Problems.

Unit II:

Queueing Theory – Introduction – Queueing system – Characteristics of Queueing system – symbols and Notation – Classifications of queues – Problems in (M/M/1) : (∞/FIFO); (M/M/1) : (N/FIFO); (M/M/C) : (∞/FIFO); (M/M/C) : (N/FIFO) Models.

Unit III:

Inventory control – Types of inventories – Inventory costs – EOQ Problem with no shortages – Production problem with no shortages – EOQ with shortages – Production problem with shortages – EOQ with price breaks.

Unit IV:

Simulation – Introduction – simulation models – Event – Types of simulation - Generation of Random Numbers – Mante-carlo simulation – simulation of queueing system.

Unit V:

Network scheduling by PERT / CPM – Introduction – Network and basic components – Rules of Network construction – Time calculation in Networks – CPM.

PERT – PERT calculations..

References:

1. Operations Research – Prem Kumar Gupta D. S. Hira, S. Chand & Company Ltd, Ram Nagar, New Delhi
2. Operations Research – Kandiswarup, P. K. Gupta, Man Mohan, S. Chand & Sons Education Publications, New Delhi, 12th Revised edition.
3. Operations Research Principles and Problems: S. Dharani Venkata Krishnan, Keerthi publishing house PVT Ltd.

ELECTIVE I - B
NUMERICAL METHODS - I

Subject Description:

This course presents method to solve linear algebraic and transcendental equations and system of linear equations. Also Interpolation by using finite difference formulae.

Goal:

It exposes the students to study numerical techniques as powerful tool in scientific computing.

Objective:

On successful completion of this course the student gain the knowledge about solving the linear equations numerically and finding interpolation by using difference formulae.

Unit I: The solution of numerical algebraic and transcendental Equations:

Bisection method – Iteration Method – Convergence condition – Regula Falsi Method – Newton – Raphson method - Convergence Criteria – Order of Convergence.

Unit II: Solution of simultaneous linear algebraic equations:

Gauss elimination method – Gauss Jordan method – Method of Triangularization – Gauss Jacobi method – Gauss Seidel method

Unit III: Finite Differences:

Differences – operators – forward and backward difference tables – Differences of a polynomial – Factorial polynomial – Error propagation in difference table.

Unit IV: Interpolation (for equal intervals):

Newton's forward and backward formulae – equidistant terms with one or more missing values – Central differences and central difference table – Gauss forward and backward formulae – Stirlings formula.

Unit V: Interpolation (for unequal intervals):

Divided differences – Properties – Relations between divided differences and forward differences – Newton's divided differences formula – Lagrange's formula and inverse interpolation.

Treatment as in

Kandasamy. P, Thilagavathi. K and Gunavathi. K "Numerical methods" – S. Chand and Company Ltd, New Delhi – Revised Edition 2007. (Chapters: 3,4,5,6,7 and 8).

References:

1. Venkataraman M. K.,"Numerical Methods in Science and Engineering" National Publishing company V Edition 1999.
2. Sankara Rao K., "Numerical Methods for Scientists and Engineers" 2nd Edition Prentice Hall India 2004.

ELECTIVE II-B
Numerical Methods II

Subject Description:

This course presents Numerical differentiation, Numerical integration and method to solve the differential equations.

Goal:

It exposes the students to study numerical techniques as powerful tool in scientific computing.

Objective:

On successful completion of this course the student gain the knowledge about solving the linear equations numerically and finding interpolation by using difference formulae.

Unit I: Numerical differentiations:

Newton's forward and backward formulae to compute the derivatives – Derivative using Stirlings formulae – to find maxima and minima of the function given the tabular values.

Unit II: Numerical Integration:

Newton – Cote's formula – Trapezoidal rule – Simpson's $1/3^{rd}$ and $3/8^{th}$ rules.

Unit III: Difference Equation:

Order and degree of a difference equation – solving homogeneous and non – homogeneous
linear difference equations.

Unit IV:

Taylor series method – Euler's method – improved and modified Euler method – Runge Kutta method(fourth order Runge Kutta method only)

Unit V: Numerical solution of O.D.E(for first order only):

Milne's predictor corrector formulae – Adam-Bashforth predictor corrector formulae – solution of ordinary differential equations by finite difference method (for second order O.D.E).

Treatment as in

Kandasamy. P, Thilagavathi. K and Gunavathi. K "Numerical methods" – S. Chand and Company Ltd, New Delhi – Revised Edition 2007.
(Chapters: 9,10,11, Appendix and Appendix E).

References:

1. Venkataraman M. K.,"Numerical Methods in Science and Engineering" National Publishing company V Edition 1999.
Sankara Rao K., "Numerical Methods for Scientists and Engineers" 2nd Edition Prentice Hall India 2004.

SEMESTER-VI
SKILL BASED SUBJECT: PAPER -IV
SUBJECT TITLE: OPERATIONS RESEARCH

Note :
Introducing theory paper as Skill Based Subject –IV Operations Research instead of Skill Based Subject –IV Operation Research - Project for B.Sc. Mathematics(Colleges) and B.Sc. Mathematics with Computer Applications(Colleges) degree programme for the candidates admitted from the academic year 2010-11

SUBJECT DESCRIPTION:
This course enhances the students knowledge in sequencing the jobs to be carried out based on cost optimization; improve the power on replacement policies; analyse the cases according to their categories and improves the programming techniques.

UNIT--I:
SEQUENCING PROBLEMS
Introduction-problem of sequencing - basic terms used in sequencing- processing n--jobs through 2 machines - processing n –jobs through k machines -- processing 2 jobs through k machines.

UNIT-II
REPLACEMENT PROBLEMS
Introduction - Replacement of equipment / assets that deteriorates gradually - replacement of equipment that fails suddenly and problems.

UNIT--III
NON-LINEAR PROGRAMMING METHODS:
Khun-tucker conditions with non-negtive constraints- Quadratic programming- Wolf's modified simplex method.

UNIT--IV:
INFORMATION THEORY:
Introduction- A measure of Information-Axiomatic Approach to Information- Entrpy-The expected information- Some properties of entropy function-Joint and conditional entropies.

UNIT -- V :
APPLICATIONS:
General solution of (mxn) rectangular games using simplex method - Reliability and system failure rates using replacement problems.

REFERENCES :
1. Operations research ; Kandiswarup ; P. K. Gupta ; Man Mohan ; S.Chand &sons education publications ; New Delhi.
2. Operations research : P K Gupta ; D S Hira ; S. Chand and company ltd. Ram Nagar; New Delhi.
3. Operations research principles problems ; S Dharani Venkata Krishnan ;keerthi publishing house Pvt. Ltd.