Revised Syllabus For B.Sc,Part II [Mathematics] (Sem III & IV)

To be implemented from June 2014.

1. TITLE: Subject Mathematics

2. YEAR OF IMPLEMENTATION : Revised Syllabus will be implemented from June 2014 onwards.

3. DURATION :B.Sc. Part- II The duration of course shall be one year and two semesters.

4. PATTERN: Pattern of examination will be semester.

5. MEDIUM OF INSTRUCTION : English

6. STRUCTURE OF COURSE:

SECOND YEAR B. Sc. (MATHEMATICS)(Semester III&IV)

Semester – III : Number of Theory papers : 2

Semester – IV : Number of Theory papers : 2

Annual Pattern : Number of Practicals : 2

7. SCHENE OF TEACHING :

Paper-No.	Title of the Paper	Total Marks	Theory per week	Practical per week
	(Semester III)			
V	**DIFFERENTIAL CALCULUS**	50	3	
VI	**DIFFERENTIAL EQUATIONS**	50	3	
	(Semester IV)			
VII	**INTEGRAL CALCULUS**	50	3	
VIII	**DISCRETE MATHEMATICS**	50	3	
	(Semester III & IV)			
CML-II	**Computational Mathematics Laboratory – II (Differential & Integral Calculus, Differential Equations, Discrete Mathematics)**	50	-----	4 *
CML-III	**Computational Mathematics Laboratory – III (Computer Programming in C and Numerical Methods)**	50	-----	4 *

* Note : 8 hours per week per batch(CML – II & CML – III) (Semester III and Semester IV)(Batch as a whole class).

Work - Load

(i) Total teaching periods for Paper – V and VII (Semester III) are **6** (3 per paper) per week .

Total teaching periods for Paper –VII and VIII (Semester IV) are **6** (3 per paper) per week.

(ii) Total teaching periods for CML- II & III **8** hours(Semester III)per week per batch (Batch as a whole class).

Total teaching periods for CML- II & III **8** hours(Semester IV)per week per batch (Batch as a whole class)

DETAILS OF SYLLABI

B.Sc. PART - II MATHEMATICS (Semester III & IV)

This Syllabus of Mathematics carries **100** marks for Semester III and carries **200** marks for Semester IV.

The distribution of marks as follows :

Semester III

Sr.No	Paper	Name of Paper	Marks
1	V	DIFFERENTIAL CALCULUS	50 (Theory)
2	VI	DIFFERENTIAL EQUATIONS	50 (Theory)

Semester IV

Sr.No	Paper	Name of Paper	Marks
1	VII	INTEGRAL CALCULUS	50 (Theory)
2	VIII	DISCRETE MATHEMATICS	50 (Theory)

Practical Annual

COMPUTATIONAL MATHEMATICS LABORATRY – II (Differential & Integral Calculus, Differential Equations, Discrete Mathematics)	50 Marks
COMPUTATIONAL MATHEMATICS LABORATRY – III (Computer Programming in C and Numerical Methods)	50 Marks

Equivalence of theory papers may be as follows

New Syllabus	Old Syllabus
Mathematics Paper – V (Differential Calculus)	Mathematics Paper – V (Differential Calculus)
Mathematics Paper – VI (Differential Equations)	Mathematics Paper – VI (Differential Equations)
Mathematics Paper –VII (Integral Calculus)	Mathematics Paper –VII (Integral Calculus)
Mathematics Paper –VIII (Discrete Mathematics)	Mathematics Paper –VIII (Number Theory)
COMPUTATIONAL MATHEMATICS LABORATRY – II (Differential & Integral Calculus, Differential Equations, Discrete Mathematics)	COMPUTATIONAL MATHEMATICS LABORATRY – II (Differential & Integral Calculus, Differential Equations, Number Theory)
COMPUTATIONAL MATHEMATICS LABORATRY – III (Computer Programming in C and Numerical Methods)	COMPUTATIONAL MATHEMATICS LABORATRY – III (Computer Programming in C and Numerical Methods)

<u>Scheme of examination</u>

The Theory examination shall be conducted semester – wise.

The Theory paper shall carry 100 Marks each semester.

The Practical examination shall be conducted at the end of each academic year.

The Practical paper shall carry 100 marks.

The evaluation of the performance of the students in theory shall be on the basis of Semester Examination .

Nature of Theory Question Paper (Each Semester)

Common Nature of Question Paper as per Science Faculty.

Nature of Practical Question Paper (For CML – II & CML – III)
(Practical Question Paper will be of 40 marks and 3 hours duration.)

Q.1 Solve any One of the following : (10 Marks)
(i)
(ii)
Q.2 Solve any One of the following : (10 Marks)
(i)
(ii)
Q.3 Solve any One of the following : (10 Marks)
(i)
(ii)
Q.4 Solve any Two of the following : (10Marks)
(i)
(ii)

*** Certified Journal carries 05 marks .**
*** For viva- voce/ Tour Report : Max. Marks 5.**

Standard of passing
As prescribed under rules and regulation for each degree program.

Requirements

Qualifications for Teacher
M.Sc. Mathematics
(with NET /SET as per existing rules)

Equipments-

Calculators	20
Computers	10
Printers	01

License software's- O/S , Application SW , Packages SW as per syllabus.

REVISED SYLLABUS OF B.Sc. Part – II (SEMESTER – III) (MATHEMATICS)

Implemented from June – 2014

Paper – V (DIFFERENTIAL CALCULUS)

Unit – 1 : <u>LIMITS AND CONTINUITY OF REAL VALUED FUNCTIONS</u> **13 lectures**

1.1 ε - δ definition of the limit of a function of one variable.

1.2 Basic properties of limits.

1.3 Continuous functions and their properties.

1.3.1 If f and g are two real valued functions of a real variables which are continuous at x = c then (a) f + g , (b) f – g, (c) f.g are continuous at x = c and

$$(d)\ \frac{f}{g}\ is\ continuous\ \ at\ \ x = c,\ g(c) \neq 0.$$

1.3.2 Composite function of two continuous functions is continuous.

1.3.3 If a function f is continuous in a closed interval [a, b]then it is bounded in [a, b].

1.3.4 If a function f is continuous in a closed interval [a, b] then it attains its bounds at least once in [a, b].

1.3.5 If a function f is continuous in a closed interval [a, b] and if f(a), f(b) are of opposite signs then there exists c $\in$ [a, b] such that f(c) = 0.

1.3.6 If a function f is continuous in a closed interval [a, b] and if f(a) $\neq$ f(b) then f assumes every value between f(a) and f(b).

1.4 Classification of discontinuities (First and second kind).

1.5 Uniform continuity.

1.5.1 A Real valued continuous function on [a, b] is uniformly continuous on [a, b].

1.6 Sequential continuity.

1.6.1 A function f defined on an interval I is continuous at a point

$c \in I$ *if and only if for every sequence* $\{C_n\}$ *converging to c,*

$\lim_{n\to\infty} f(C_n) = c.$

1.7 Differentiability at a point, Left hand derivative, Right hand derivative, Differentiability in the interval [a,b].

1.7.1 Theorem: Continuity is a necessary but not a sufficient condition for the existence of a derivative.

Unit – 2 : <u>JACOBIAN</u> **10 lectures**

2.1 Definition of Jacobian and examples.

2.2 Properties of Jacobians.

2.2.1 If J is Jacobian of u, v with respect to x, y and J′ is Jacobian of x, y with respect to u, v then JJ′ = 1.

2.2.2 If J is Jacobian of u, v, w with respect to x, y, z and J′ is Jacobian of x, y, z with respect to u, v, w then JJ′ = 1.

2.2.3 If p, q are functions of u, v and u, v are functions of x, y then prove that $\frac{\partial(p,q)}{\partial(x,y)} = \frac{\partial(p,q)}{\partial(u,v)} \cdot \frac{\partial(u,v)}{\partial(x,y)}$.

2.2.4 If p, q, r are functions of u, v, w and u, v, w are functions of x, y, z then prove that $\frac{\partial(p,q,r)}{\partial(x,y,z)} = \frac{\partial(p,q,r)}{\partial(u,v,w)} \cdot \frac{\partial(u,v,w)}{\partial(x,y,z)}$.

2.2.5 Examples on these properties.

Unit – 3 : <u>EXTREME VALUES</u> **11 lectures**

3.1 Definition of Maximum, Minimum and stationary values of function of two variables.

3.2 Conditions for maxima and minima (Statement only) and examples.

3.3 Lagrange's method of undetermined multipliers of three variables.

3.3.1 The extreme values of the function f(x, y, z) subject to the condition ϕ(x, y, z) = 0.

3.3.2 The extreme values of the function f(x, y, z) subject to the

conditions $\phi(x, y, z) = 0$ and $\psi(x, y, z) = 0$.

3.3.3 Examples based on Lagrange's method of undetermined multipliers of three variables.

3.3.4 Errors and approximations.

Unit – 4 : <u>VECTOR CALCULUS</u> **11 lectures**

4.1. Differentiation of vector.

4.2. Tangent line to curve.

4.3. Velocity and Acceleration.

4.4. Gradient, Divergence and Curl: Definitions and examples.

4.5.Solenoidal and Irrotational Vector.

4.6. Conservative vector Field.

4.7.Properties of Gradient Divergence and Curl

4.7.1. If $\bar{a}$ is a constant vector then div $\bar{a} = 0$ and curl $\bar{a} = \bar{0}$

4.7.2. div $(\bar{f} + \bar{g})$ = div $\bar{f}$ + div $\bar{g}$

4.7.3. curl $(\bar{f} + \bar{g})$ = curl $\bar{f}$ + curl $\bar{g}$

4.7.4. If $\bar{f}$ is a vector point function and Φ is a scalar point function then Div $(\Phi\bar{f}) = \Phi$ div $\bar{f}$ + (grad Φ).$\bar{f}$

4.7.5 If $\bar{f}$ is a vector point function and Φ is a scalar point function then curl $(\Phi\bar{f})$ = grad$\Phi \times \bar{f}$ + Φ curl$\bar{f}$

4.7.6. div $(\bar{f} \times \bar{g}) = \bar{g}$.curl $\bar{f}$ – $\bar{f}$.curl $\bar{g}$

4.7.7. curl $(\bar{f}.\bar{g}) = \bar{f} \times$ curl $\bar{g}$ + $\bar{g} \times$ curl$\bar{f}$ + $(\bar{f}.\nabla)\,\bar{g}$ + $(\bar{g}.\ \square)\,\bar{f}$

4.7.8. divgrad $\Phi = \nabla^2\Phi$

4.7.9- curlgrad $\Phi = \bar{0}$

4.7.10. div curl $\bar{f} = 0$

4.7.11. curl curl $\bar{f}$ = grad div $\bar{f}$ – $\nabla^2\bar{f}$

REFERENCE BOOKS

1. **P. N. and J. N. Wartikar, Applied Engineering Mathematics.**
2. **Differential & Integral Calculus; G. V. Kumbhojkar, G. V. Kumbhojkar; C. Jamnadas & Co.**
3. **A Text Book of Applied Mathematics, P. N. and J. N. Wartikar, A. V.G. Publication, Pune.**
4. **A Text Book of Vector Calculus,Shanti Narayan and J.N.Kapur, S. Chand & Co., New Delhi.**
5. **B.S.Phadatare, U.H.Naik, P.V.Koparde, P.D.Sutar, P.D.Suryvanshi, M.C.Manglurkar, A Text Book Of Advanced Calculus Published by Shivaji University Mathematics Society (SUMS), 2005.**
6. **S.B.Kalyanshetti, S.D.Thikane, S.R.Patil, N. I. Dhanashetti, A Text Book Of Mathematics -Advanced Calculus Published by Sheth Publishers Pvt. Ltd. Mumbai.**
7. **Gorakh Prasad, Differential Calculus, Pothishala Pvt. Ltd., Allahabad.**
8. **Murray R. Spiegel, Theory and Problems of Advanced Calculus, Schaum Publishing Co., New York.**
9. **N. Piskunov , Differential and integral Calculus, Peace Publishers, Moscow.**
10. **Kulkarni, Jadhav, Patwardhan, Kubade, Mathematics- Advanced Calculus , Phadke Prakashan.**

Paper – VI (DIFFERENTIAL EQUATIONS)

Unit – 1 : <u>HOMONOGENEOUS LINEAR DIFFERENTIAL EQUATIONS</u> **8 lectures**

1.1 General form of Homogeneous Linear Equations of Higher order and it′s solution.

1.2 Equations reducible to homogeneous linear form.

Unit – 2 : <u>SECOND ORDER LINEAR DIFFERENTIAL EQUATIONS</u> **17 lectures**

2.1 General form : $\frac{d^2y}{dx^2} + P\frac{dy}{dx} + Qy = R.$

2.2 Methods of solution:

2.2.1 Complete solution of Linear differential equation when one integral is known.

2.2.2 Transformation of the equation by changing the dependent variable (Removable of 1^{st} order derivative) .

2.2.3 Transformation of the equation by changing the independent variable.

2.3 Method of variation of parameters.

Unit –3 : <u>ORDINARY SIMULTANEOUS DIFFERENTIAL EQUATIONS</u> **8 lectures**

3.1 Simultaneous linear differential equations of the form

$$\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}.$$

3.2 Methods of solving simultaneous differential equations.

3.3 Geometrical Interpretation.

Unit –4 : <u>TOTAL DIFFERENTIAL EQUATIONS</u> **12 lectures**

4.1 Total differential equations [Pfaffian differential equation]

Pdx + Qdy + Rdz = 0.

4.2 Necessary condition for integrability of total differential equations.

4.3 The condition of exactness.

4.4 Methods of solving total differential equations :

(a) Method of Inspection ,

(b) One variable regarding as a constant.

4.5 Geometrical Interpretation.

4.6 Geometrical Relation between Total differential equations

and Simultaneous differential equations.

REFERENCE BOOKS

1. **T.A.Teli, S.P.Thorat, A.D.Lokhande, S.M.Pawar, D.S.Khairmode, A Text Book Of Differential Equations Published by Shivaji University Mathematics Society (SUMS), 2005.**
2. **S.B.Kalyanshetti, S.D.Thikane, S.R.Patil, N. I. Dhanashetti, A Text Book Of Mathematics - Differential Equations Published by Sheth Publishers Pvt. Ltd. Mumbai.**
3. **D. A. Murray, Introductory course on differential equations, Orient Longman, (India) 1967.**
4. **Diwan and Agashe, Differential equation,**
5. **Sharma and Gupta, Differential equation, Krishna Prakashan Media co., Meerut.**
6. **Kulkarni, Jadhav, Patwardhan, Kubade, Mathematics- Differentiual Equations , Phadke Prakashan.**
7. **Frank Ayres,Theory and problems of differential equations, McGraw-Hill Book company, 1972.**

REVISED SYLLABUS OF B.Sc. Part – II (SEMESTER–IV)

(MATHEMATICS)

Implemented from June – 2014

Paper – VII (INTEGRAL CALCULUS)

Unit – 1 : <u>GAMMA AND BETA FUNCTIONS</u> **12 lectures**

1.1 Definition of Gamma function

1.2 Properties of Gamma function.

1.2.1 $\Gamma(1) = 1.$

1.2.2 Recurrence formula : $\Gamma(n) = (\mathbf{n}-1)\,\Gamma(n-1)$.

1.2.3 $\Gamma(n) = (\mathbf{n-1})!,\ where\ n\ is\ a\ positive$ integer.

1.2.4. $\lim_{n\to\infty} \overline{|n} = \infty$, $\lim_{n\to 0} \overline{|n} = 0$.

1.2.5 $\overline{|n} = 2\int_0^\infty e^{-x^2} . x^{2n-1} dx$, n > 0

1.2.6 $\overline{|n} = \alpha^n \int_0^\infty e^{-\alpha x} x^{n-1} dx$, where n > 0, ∝ > 0.

1.2.7 $\int_0^\infty e^{-kx} . x^{n-1} dx = \frac{\overline{|n}}{k^n}$, *where n* > 0 , *k* > 0.

1.2.8 . $\overline{\left|\frac{1}{2}\right.} = \sqrt{\pi}$.

1.3 Definition of Beta function.

1.4 Properties of Beta function.

1.4.1 Symmetric property : β(m, n) = β(n, m).

1.4.2 $\beta(m,n) = 2\int_0^{\pi/2} \sin^{2m-1}\theta \cos^{2n-1}\theta \, d\theta.$

1.4.3 $\int_0^{\pi/2} \sin^p \theta \cos^q \theta \, d\theta = \frac{1}{2}\beta\left(\frac{p+1}{2}, \frac{q+1}{2}\right)$.

1.4.4 $\beta(m,n) = \int_0^\infty \frac{x^{m-1}}{(1+x)^{m+n}} dx.$

1.4.5 $\int_0^\infty \frac{x^{m-1}}{(a+bx)^{m+n}} dx = \frac{1}{a^n b^m} \beta(m,n).$

1.4.6 $\int_0^\infty \frac{x^{m-1} + x^{n-1}}{(1+x)^{m+n}} dx = \beta(m,n).$

1.5 Relation between Beta and Gamma function

$$\beta(m, n) = \frac{\Gamma(m)\,\Gamma(n)}{\Gamma(m+n)}.$$

1.7 Duplication formula : $2^{2m-1}\,\Gamma(m)\,\Gamma\left(m+\tfrac{1}{2}\right) = \Gamma(2m)\,\sqrt{\pi}.$

1.8 $\Gamma\left(\frac{1}{4}\right)\cdot\Gamma\left(\frac{3}{4}\right) = \pi\sqrt{2}$.

Unit – 2 : <u>MULTIPLE INTEGRALS</u> **10 lectures**

2.1 Double Integral : Evaluation of double integrals.

2.2 Evaluation of double integrals in Cartesian coordinates.

2.3 Evaluation of double integrals over the given region.

2.4 Evaluation of double integrals in polar coordinates.

2.5 Evaluation of double integrals by changing the order of integration.

2.6 Triple integrals : Evaluation of triple integrals.

Unit – 3 : <u>FOURIER SERIES</u> **13 lectures**

3.1 Definition of Fourier series with Dirichlet condition.

3.2 Fourier Series for the function f(x) in the interval [- π, π] .

3.3 Fourier Series for the function f(x) in the interval [- c, c].

3.4 Fourier Series for the function f(x) in the interval [0, 2π].

3.5 Fourier Series for the function f(x) in the interval [0, 2c].

3.6 Even and odd functions.

3.7 Half Range Series.

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Unit – 4 : <u>DIFFERENTIATION UNDER INTEGRAL SIGN AND ERROR FUNCTION</u>

10 lectures

4.1 Introduction

4.2 Integral with its limit as constant.

4.3 Integral with limit as function of the parameter [Leibnitz Rule]

4.4 Error Function

REFERENCE BOOKS

1. **P. N. and J. N. Wartikar, <u>Elements of Applied Mathematics</u>.**
2. **B.S.Phadatare, U.H.Naik, P.V.Koparde, P.D.Sutar, P.D.Suryvanshi, M.C.Manglurkar, <u>A Text Book Of Advanced Calculus</u> Published by Shivaji University Mathematics Society (SUMS), 2005.**
3. **S.B.Kalyanshetti, S.D.Thikane, S.R.Patil, N. I. Dhanashetti, <u>A Text Book Of Mathematics -Advanced Calculus</u> Published by Sheth Publishers Pvt. Ltd. Mumbai.**
4. **Gorakh Prasad, <u>Integral Calculus</u>, Pothishala Pvt. Ltd., Allahabad.**
5. **N. Piskunov , <u>Differential and integral Calculus</u>, Peace Publishers,**

6. Shanti Narayan, <u>Integral Calculus</u>, S. Chand and Company, New Delhi.

7. Kulkarni, Jadhav, Patwardhan, Kubade, Mathematics- Advanced Calculus , Phadke Prakashan.

8. P. N. and J. N. Wartikar, <u>A Text book of applied mathematics</u>.

Mathematics Paper VIII
(Discrete Mathematics)

Unit 1. Relations **10 Lectures**

1.1 Product sets, Relations, Inverse relation

1.2 Pictorial representation of relations

1.3 Composition of relations and matrices

1.4 Types of relation – Reflexive, Symmetric, Anti symmetric, Transitive. and its examples

1.5 Closure properties and its examples

1.6 Equivalence relations and partitions.

1.7 Examples on Equivalence relation

1.8 Partial ordering relations.

1.9 Congruence Relation

1.9.1 Theorem : (with proof) Let m be a positive integer.

Then :

(i) For any integer a, we have $a \equiv a \pmod{m}$

(ii) If $a \equiv b \pmod{m}$, then $b \equiv a \pmod{m}$

(iii) If $a \equiv b \pmod{m}$ and $b \equiv c \pmod{m}$,

then $a \equiv c \pmod{m}$

1.9.2 Theorem : (with proof) Let $a \equiv c \pmod{m}$ and $b \equiv d \pmod{m}$.

Then :

(i) $a + b \equiv c + d \pmod{m}$

(ii) $a.b \equiv c.d \pmod{m}$

Unit 2. Division Algorithm 12 Lectures

2.1 Division Algorithm for positive integers (with proof)

2.2 Division Algorithm for integers (without proof)

2.3 Basic properties of divisibility

2.3.1 Theorem : (statement only) Let a,b,c are integers

(i) If $a|b$ and $b|c$, then $a|c$

(ii) If $a|b$ then, for any integer x, $a|bx$

(iii) If $a|b$ and $a|c$, then $a|(b+c)$ and $a|(b-c)$

(iv) If $a|b$ and $b \neq 0$, then $a = \pm b$ or $|a| < |b|$

(v) If $a|b$ and $b|a$, then $|a|=|b|$, i.e., $a= \pm b$

(vi) If $a|1$, then $a = \pm 1$

2.4 G.C.D.

2.4.1 Theorem : (with proof) Let d is the smallest Integer of the form $ax + by$ then $d = g.c.d.(a,b)$

2.4.2 Theorem : (with proof) If d = g.c.d.(a,b) then there exists integers x and y such that d = ax + by

2.5 Properties of g.c.d. (with proof)

2.5.1 Theorem : (with proof) A positive integer d = gcd(a, b) if and only if d has following two properties :

(1) d divides both a and b

(2) If c divides both a and b, then c|d

2.5.2 Simple properties of the greatest common divisor (with proof)

(a) gcd (a, b) = gcd (b, c)

(b) If x > o, then gcd (ax, bx) = x,gcd (a, b)

(c) If d = gcd (a, b), then gcd (a|d, b|d) = 1

(d) For any integer x, gcd (a, b) = gcd (a,b + ax)

2.7 Euclidean algorithm

2.8 Examples on Euclidean algorithm.

2.9 Relatively prime integers

2.9.1 Theorem : (with proof) If g.c.d.(a, b) = 1 and a and b both divides C then ab divides C.

2.9.2 Theorem : (with proof) If a|bc and g.c.d(a, b) = 1 then a|c.

2.9.3 Theorem : (with proof) Let a prime p divides a product ab. Then p|a or p|b.

Unit 3 :- LOGIC **10 Lectures**

3.1 Revision

3.1.1 Logical propositions (statements)

3.1.2 Logical connectives

3.1.3 Propositional Form

3.1.4 Truth tables

3.1.5 Tautology and contradiction

3.1.6 Logical Equivalence

3.2 Algebra of propositions

3.3 Valid Arguments

3.4 Rules of inference

3.5 Methods of proofs

3.5.1 Direct proof

3.5.2 Indirect proof

3.6 Predicates and Quantifiers

Unit 4:- Graph Theory 13 Lectures

4.1 Graphs and Multi-graphs

4.2.1 Degree of a vertex

4.2.2 Hand Shaking Lemma – The sum of degree of all vertices of a graph is equal to twice the number of edges .

4.2.3 Theorem :- An undirected graph has even number of vertices of odd degree.

4.3 Types of graphs

4.3.1 Complete graph

4.3.2 Regular graph

4.3.3 Bipartite graph

4.3.4 Complete bipartite graph

4.3.5 Complement of a graph

4.4 Matrix representation of graph

4.4.1 Adjacency Matrix

4.4.2 Incidence Matrix

4.5 Connectivity

4.5.1 Walk , trail, path and cycle.

REFERENCE BOOKS:

1. **Discrete Mathematics** by S. R. Patil , M. D. Bhagat , R. S. Bhamare , D. M. Pandhare, Nirali Prakashan, pune
2. **DISCRETE MATHEMATICAL STRUCTURES**(6th Edition) by Kolman, Busby, Ross, Pearson Education (Prentice Hall)
3. SCHAUM'S outlines " **DISCRETE MATHEMATICS** "(Second edition) by Seymour Lipschutz , Marc Lipson,Tata McGraw-Hill Publishing Company Limited, New Delhi

Computational Mathematics Laboratory – II

(Differential and Integral Calculus, Differential Equations, Discrete Mathematics)

SEMESTER – III		
Sr.No.	**Topic**	**No. of Practicals**
1	**Jacobian**	**1**
2	**Extreme values for two variables**	**1**
3	**Langrange's Method of Undetermined Multipliers**	**1**
4	**Div, Curl & Gradient (examples)**	**1**
5	**Homogeneous Liner Differential Equations and Reduced to Homogeneous Linear Differential Equations**	**1**
6	**Second Order Linear Differential Equations (One Integral is known)**	**1**
7	**Second Order Linear Differential Equations (Removal of first order derivative)**	**1**

8	**Second Order Linear Differential Equations (By changing independent variable)**	**1**
SEMESTER – IV		
9	**Gamma and Beta Functions**	**1**
10	**Evaluation of double integrals over the given region**	**1**
11	**Fourier Series : [0, 2π]**	**1**
12	**Fourier Series : [-π,π]**	**1**
13	**Examples on Relation & Equivalence relations**	**1**
14	**Euclidean Algorithm for finding g.c.d.**	**1**
15	**Types of graphs**	**1**
16	**Matrix representation of graph**	**1**

Computational Mathematics Laboratory - III
(Computer Programming in C and Numerical Methods)

SEMESTER - III		
Sr.No.	**Topic**	**No. Of Practicals**
1	**C-Introduction : History, Identifiers Keywords, constants, variables, Mathematical operations.**	**1**
2	**Data types: Integer, real, character types, input/output statements, C-program structure, simple C-programs.**	**1**
3	**Control Structures (descision): if, If – else statements, simple illustrative C-programs.**	**1**
4	**Loop Structure (I) : for loop, *-figures, factorial, series sum problems, Fibonacci sequence.**	**1**

5	**<u>Loop</u> <u>Structure</u> (II) : while, do-while loops, exp(x), cos(x), sin(x) by series sum and comparison with lib. Function value.**	**1**
6	**<u>Break</u>, <u>Continue</u>, <u>Go to</u>, <u>switch statements</u> : Illustrative C-programs. Testing a number to be prime or not prime.**	**1**
7	**<u>Arrays</u> 1- <u>dimensional</u> : Max/min of n elements, sorting of an array.**	**1**
8	**<u>Arrays</u> 2- <u>dimensional</u> : Transpose, addition, subtraction, multiplication in case of matrices.**	**1**
	SEMESTER - IV	
9	**<u>Function</u> : User defined functions, C-program - $^{n}C_{r}$ using function.**	**1**
10	**<u>Numerical</u> <u>Integrations</u> : (In C Program) a) Trapezoidal rule b) Simpson's $(1/3)^{rd}$ rule c) Simpson's $(3/8)^{th}$ rule.**	**2**
11	**<u>Numerical</u> <u>Methods</u> <u>for</u> <u>solution</u> <u>of</u> <u>Linear</u> <u>Equations</u>: (Using Calculators) a) Gaussian Elimination Method b) Gauss – Jorden (Direct)Method c) Gauss Seidel (Iterative)Method.**	**3**
12	**<u>Numerical</u> <u>Methods</u> <u>for</u> <u>solution</u> <u>of</u> <u>Ordinary</u> <u>Differential</u> <u>Equations</u>: (Using Calculators) a) Euler Method**	**2**

	b) Euler Modified Method **c) Runge- Kutta Second and Fourth order Method.**		

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