SAURASHTRA UNIVERSITY
RAJKOT.

Syllabus of B.Sc. Semester-3
According to Choice Based Credit System
Effective from June - 2011

• Programme: B.Sc.
• Semester: 3
• Subject: Mathematics
• Course code: BSMT-301(A)-Theory
• Title of Course: Linear Algebra & Calculus

• Section-wise
  Distribution of Marks
  for External Examination:
  
  Section-A
  (MCQ test) ➞ 20 Marks
  Section-B
  (Descriptive type) ➞ 50 Marks
  
  Total Marks ➞ 70 Marks

• Segment-wise
  Distribution of Marks
  for Internal Examination:
  
  Assignments ➞ 10 Marks
  QUIZ test ➞ 10 Marks
  Internal exam. ➞ 10 Marks
  
  Total Marks ➞ 30 Marks

• Credit Of The Course 4 Credits
UNIT 1: [25 MARKS]

[A] **Vector Space:**
Definition and examples, Linear dependence, independence and their properties, Linear span, Subspace, Sum and direct sum of subspaces, Basis and finite dimension of vector space, Existence theorem for basis, Invariance of the number of the elements of a basis set, Existence of complementary subspace of subspace of finite dimensional vector space, Dimension of sum of subspaces.

[B] **Linear Transformations:**
Linear transformations and their representation as matrices, The algebra of linear transformations, Rank and Nullity theorem, Ad joint of a linear transformation, Eigen values and eigen vectors of linear transformations, Singular and non-singular transformations, Diagonalization, Inverse linear transformations.

[C] **Series:**
Series of non-negative terms, p-test, Comparison test, Ratio test, Raabe’s test, Alternative series, Absolute and conditional convergence, Convergence of power series. (All the tests without proof ).

UNIT 2: [25 MARKS]

[A] **Numerical Methods for solving an equation:**

[B] **Curvature:**
Various formulae for curvature(formulae for Cartesian coordinates, parametric equations and Polar coordinates only), Newton’s method for curvature at origin, Concavity, Convexity and point of inflexion

[C] **Asymptotes and multiple points:**
Asymptotes parallel to co-ordinate axes, oblique type and algebraic methods, Rules for finding asymptotes. Multiple points, Types of double points.
Notes:
- There shall be SIX periods of 55 minutes per week for Mathematics- **BSMT-301(A)-Theory**.
- There shall be one question paper of 70 marks & 3 hours for Mathematics- **BSMT-301(A)-Theory**

**Format of Question Paper**

- There shall be TWO sections in this paper i.e. Section- A and Section -B.

**Section – A**
Section- A is of 20 Marks with ONE hour time duration with 20 MCQ type questions (multiple choice questions) covering the whole syllabus in equal weightage and these questions to be answered in OMR sheet.

**Section – B**
Section B is of 50 Marks with TWO hours time duration with the following type of TWO questions covering the whole syllabus in equal weightage, each of twenty five marks to be answered in the separate answer-book.
Question 1 and 2 will cover unit 1 and 2 respectively.

<table>
<thead>
<tr>
<th>Question no.</th>
<th>(A) Answer any three out of six</th>
<th>6 Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>(B)</td>
<td>Answer any three out of six</td>
<td>9 Marks</td>
</tr>
<tr>
<td>(C)</td>
<td>Answer any two out of five</td>
<td>10 Marks</td>
</tr>
</tbody>
</table>

**TOTAL** 25 MARKS

**Reference Books:**
- Introduction to Numerical Analysis by C.E. Froberg, Addison- Wesley 1979
- Numerical Analysis by G. Shankar Rao
- Linear Algebra by J.N. Sharma and A.R. Vasishtha, Krishna Prakashan Mandir, Meerut
- An Introduction to Linear Algebra by Krishnamurthy, Mainra and Arora
- Matrix and Linear Algebra by K.B. Datta, Prentice Hall of India Pvt. Ltd. New Delhi
- Linear Algebra by K.Hoffman and R. Kunza
- Basic Linear Algebra with Matlab by S.K.Jain, A.Gunawardena & P.B. Bhattacharya
- Differential Calculus by Shanti Narayan, S.Chand & co., New Delhi
- Differential Calculus by Gorakhprasad, Pothishala Pvt. Ltd., Allahabad
- Mathematical Analysis by S.C. Malik, Wiley, Eastern Ltd., New Delhi
- Higher Algebra by Barnnard & Child
SAURASHTRA UNIVERSITY
RAJKOT.

Syllabus of B.Sc. Semester-3
According to Choice Based Credit System
Effective from June - 2011

- Programme: B.Sc.
- Semester: 3
- Subject: Mathematics
- Course code: BSMT-301(B) (Practical)
- Title of Course: Numerical Methods
- Total Marks of External Practical Examination: 35 Marks
- Total Marks of Internal Practical Examination: 15 Marks
  Continuous internal assessment of practical work
- Total Marks of Practical Examination: External \(\rightarrow\) 35 Marks
  Internal \(\rightarrow\) 15 Marks
  \[\text{Total} \rightarrow 50 \text{Marks}\]
- Credit Of The Course: 3 Credits
SAURASHTRA UNIVERSITY, RAJKOT

B.Sc. SEMESTER -3 (CBCS)
MATHEMATICS PAPER- BSMT-301(B) (Practical)
Numerical Methods

[ 50 Marks / 3Hours]

Pr. No. (1) Solution of algebraic and transcendental equation by Graphical method
Pr. No. (2) Solution of algebraic and transcendental equation by Bisection method
Pr. No. (3) Solution of algebraic and transcendental equation by False position method (Regula Falsi Method)
Pr. No. (4) Solution of algebraic and transcendental equation by Secant method (Secant Method)
Pr. No. (5) Solution of algebraic and transcendental equation by Iteration method
Pr. No. (6) Solution of algebraic and transcendental equation by Newton-Raphson’s method
Pr. No. (7) Applications of Newton-Raphson’s method
Pr. No. (8) Transformation of equation
Pr. No. (9) Derivatives of a polynomial by synthetic division method
Pr. No. (10) Horner’s method for solving polynomial equation.
Journal and viva

Notes:
- There shall be SIX periods of 1 hour per week per batch of 15 students.
- 10 practical should be done during semester-3.
- At the time of examination candidate must bring his/her own practical journal duly certified and signed by H.O.D.
- There shall be one question paper of 35 Marks and 3 Hours for practical examination
- There shall be 15 marks for Internal Practical Examination
  (i.e. Continuous internal assessment of performance of each student during the practical work.)

Format of Question Paper for Practical Examination

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Question 1</td>
<td>Answer any THREE out of FIVE</td>
<td>27</td>
</tr>
<tr>
<td>Question 2</td>
<td>Journal and Viva:</td>
<td>8</td>
</tr>
<tr>
<td>Question 3:</td>
<td>Internal Practical Examination</td>
<td>15</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>50</td>
</tr>
</tbody>
</table>
SAURASHTRA UNIVERSITY
RAJKOT

Syllabus of B.Sc. Semester-4
According to Choice Based Credit System
Effective from June - 2011

- Programme: B.Sc.
- Semester: 4
- Subject: Mathematics
- Course code: BSMT-401(A)-Theory
- Title of Course: Advanced Calculus & Linear Algebra

Section-wise Distribution of Marks for External Examination:

| Section-A (MCQ test) | 20 Marks |
| Section-B (Descriptive type) | 50 Marks |
| Total Marks | 70 Marks |

Segment-wise Distribution of Marks for Internal Examination:

| Assignments | 10 Marks |
| QUIZ test | 10 Marks |
| Internal exam. | 10 Marks |
| Total Marks | 30 Marks |

Credit Of The Course: 4 Credits
SAURASHTRA UNIVERSITY, RAJKOT
B.Sc. SEMESTER - 4 (CBCS)
MATHEMATICS PAPER- BSMT-401(A)
Advanced Calculus & Linear Algebra (Theory)

[70 Marks / 3Hours]

UNIT 1:

[a] Partial Differentiation:
Limit and continuity of function of several variables.
Partial derivatives, Partial derivatives of higher order, Partial differentiation of composite function, Homogeneous function, Euler’s theorem on homogeneous function of two and three variables, Total differential and chain rule, Change of variables, Partial differentiation of implicit function, Young’s and Schwartz’s theorem (without proof).

[b] Applications of Partial Derivatives:
Errors and approximate values, Jacobians, Taylor’s theorem of function of two variables, Maxima, Minima, Saddle points of function of several variables, Lagrange’s method of undetermined multipliers.

[c] Vector Differentiation:
Vector point functions and Scalar point functions, Vector Differentiation, Laplace operator, Laplace equation, Gradient, Divergence and Curl.

UNIT 2:

[a] Multiple Integral:
Double and triple integrals, Application of double and triple integration as area and volume, Change of variable by Jacobian, Change of variables from Cartesian to polar co-ordinates and triple integration in spherical co-ordinates and cylindrical co-ordinates.

[b] Vector Integration
Line integral and Green’s theorem., Surface integral, Volume Integral, Divergence theorem(Gauss) and Stoke’s theorem.

[c] Beta & Gamma Functions:
Beta and Gamma functions and relation between them. Value of $\int_{-\infty}^{\infty} e^{-x^2} dx$ as gamma function, Duplication formula. Legendre’s Formula(without proof).

[d] Inner Product Spaces:
Inner product spaces, Cauchy-Schwartz inequality, Triangular inequality, Orthogonal vectors, Orthonormal vectors, Orthogonal sets and bases, Orthonormal bases, Gram- Schmidt orthogonalization process.
Notes:
• There shall be **SIX** periods of **55** minutes per week for Mathematics- **BSMT-401(A)-Theory**.
• There shall be one question paper of **70** marks & **3** hours for Mathematics- **BSMT-401(A)-Theory**

**Format of Question Paper**

• There shall be **TWO** sections in this paper i.e. Section- **A** and Section- **B**.

**Section – A**
Section- **A** is of 20 Marks with **ONE** hour time duration with 20 MCQ type questions (multiple choice questions) covering the whole syllabus in equal weightage to be answered in OMR sheet.

**Section – B**
Section- **B** is of 50 Marks with **TWO** hours time duration with the following type of **TWO** questions covering the whole syllabus in equal weightage, each of twenty five marks to be answered in the separate answer-book.
Question 1 and 2 will cover unit 1 and 2 respectively.

<table>
<thead>
<tr>
<th>Question no.</th>
<th>(A) Answer any THREE out of SIX</th>
<th>6 Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(B) Answer any THREE out of SIX</td>
<td>9 Marks</td>
</tr>
<tr>
<td></td>
<td>(C) Answer any TWO out of FIVE</td>
<td>10 Marks</td>
</tr>
</tbody>
</table>

**TOTAL** 25 **MARKS**

**Reference Books:**

• Mathematical Analysis by S.C. Malik, Wiley, Eastern Ltd., New Delhi
• Mathematical Analysis by T.M. Apostol, Narosa Publishing House, New Delhi
• A course of mathematical Analysis by Shanti Narayan , S.Chand & Co., New Delhi
• Linear Algebra by J.N. Sharma and A.R. Vasishtha, Krishna Prakashan Mandir, Meerut
• An Introduction to Linear Algebra by Krishnamurthy, Mainra and Arora
• Matrix and Linear Algebra by K.B. Datta, Prentice Hall of India Pvt. Ltd. New Delhi
• Linear Algebra by K.Hoffman and R. Kunza
• A text book of Modern Abstract Algebra by Shanti Narayan, S.Chand & Co., New Delhi
• Basic Linear Algebra with Matlab by S. K. Jain, A. Gunawardena & P.B. Bhattacharya
SAURASHTRA UNIVERSITY
RAJKOT

Syllabus of B.Sc. Semester-4
According to Choice Based Credit System
Effective from June - 2011

- Programme: B.Sc.
- Semester: 4
- Subject: Mathematics
- Course code: BSMT-401(B) (Practical)
- Title of Course: Introduction to SciLab
- Total Marks of External Practical Examination: 35 Marks
- Total Marks of Internal Practical Examination: 15 Marks (Continuous internal assessment of practical work)
- Total Marks of Practical Examination: External 35 Marks, Internal 15 Marks
  Total 50 Marks

- Credit Of The Course: 3 Credits
<table>
<thead>
<tr>
<th>Practical no.</th>
<th>Objective of Practical</th>
<th>MARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>(1) To input row vectors and column vectors.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(2) To input square and rectangular matrices.</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>(1) To obtain addition, subtraction and multiplication, division of matrices and multiplication of matrix with scalar.</td>
<td>9 Marks</td>
</tr>
<tr>
<td></td>
<td>(2) To obtain sub matrices of given matrix and to delete rows and columns.</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>(1) To find minors, cofactors and adjoint of a matrix.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(2) To find inverse of the matrix using adjoint of a matrix</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(3) To learn commands zeros, ones, eye, rand, det(), inv(), command for transpose.</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>(1) To draw the graph of a circle.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(2) To draw the graph of a parabola</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>(1) To draw the graph of an ellipse.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(2) To draw the graph of a hyperbola.</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>(1) To draw graph of $y = \sin(x)$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(2) To draw graph of $y = \cos(x)$.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(3) To draw graph of $y = \sec(x)$.</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>(1) To draw graph of $y = \csc(x)$.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(2) To draw graph of $y = \tan(x)$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(3) To draw graph of $y = \cot(x)$.</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>(1) To draw graph of $y = \sin^{-1}(x)$</td>
<td>18 Marks</td>
</tr>
<tr>
<td></td>
<td>(2) To draw graph of $y = \cos^{-1}(x)$.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(3) To draw graph of $y = \sec^{-1}(x)$</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>(1) To draw graph of $y = \csc^{-1}(x)$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(2) To draw graph of $y = \tan^{-1}(x)$.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(3) To draw graph of $y = \cot^{-1}(x)$.</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>(1) To draw graph of $y = \exp(x)$.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(2) To draw graph of $y = \log_{e}(x)$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(3) To draw graph of $y = \log_{10}(x)$.</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>(1) To draw graph of $y = \cosh(x)$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(2) To draw graph of $y = \tanh(x)$</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>(1) To draw graph of $y = \sech(x)$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(2) To draw graph of $y = \csch(x)$.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Journal and Viva</th>
<th>8 Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Marks</strong></td>
<td></td>
<td>35 Marks</td>
</tr>
</tbody>
</table>
Notes:

- There shall be **SIX** periods of **1 hour** per week per batch of **15** students.
- **At least 10** practical should be done during the semester.
- At the time of examination candidate must bring his/her own practical journal duly certified and signed by **H.O.D.**
- There shall be one question paper of **35 Marks** and **3 Hours** for practical examination
- There shall be **15 marks** for Internal Practical Examination
  (i.e. Continuous internal assessment of performance of each student during the practical work.)

Format of Question Paper for Practical Examination

<table>
<thead>
<tr>
<th>Question 1</th>
<th>Answer any <strong>THREE</strong> out of <strong>FIVE</strong></th>
<th>9+9+9=</th>
<th>27 Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Question 2</td>
<td>Journal and Viva</td>
<td></td>
<td>8 Marks</td>
</tr>
<tr>
<td>Question 3</td>
<td>Internal Practical Examination</td>
<td></td>
<td>15 Marks</td>
</tr>
</tbody>
</table>

**TOTAL Marks:** 50 Marks

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