B.Sc. (Hons.) Mathematics

Course Structure and Syllabus

University Campus

(Based on Choice Based Credit System)

2019 onwards
DEPARTMENT OF MATHEMATICAL SCIENCES

MISSION

1. To offer globally-relevant, industry-linked, research-focused, technology-enabled seamless education at the graduate, postgraduate and research levels in various areas of Mathematical sciences keeping in mind that the manpower so spawned is excellent in quality, is relevant to the global scientific and technological needs, is motivated to give its best and is committed to the growth of the Nation;

2. To develop and conduct continuing education programs for Science graduates with a view to update their fundamental knowledge base and problem-solving capabilities in the various areas of core specialization of the University;

3. To develop comprehensive linkages with premier academic and research institutions within the country and abroad for mutual benefit.
B.Sc. (Honours Mathematics) Program

PROGRAM OBJECTIVES
Objectives of the program are to catch young and talented students, motivated to study Mathematics and to nurture them to develop their mathematical reasoning and logics. Other objectives of the program are to inspire students to pursue study in higher mathematics and grow as a skillful mathematician to cater the needs of knowledgeable society.

Duration: B.Sc. (Hons) Mathematics is a graduate level program offered by the Department of Mathematical Sciences. This is a 3-years program, consisting of six semesters with two semesters per year.

Program Code: BSHM (Bachelors of Science (Hons) in Mathematics)

Eligibility: 10+2 in any stream with Mathematics as one of the subjects with at least 50% marks in aggregate.

PROGRAM EDUCATIONAL OBJECTIVES: At the end of the program, the student will be able to:

<table>
<thead>
<tr>
<th>PEO1</th>
<th>Apply principles of basic science concepts in understanding, analysis and prediction of mathematical systems.</th>
</tr>
</thead>
<tbody>
<tr>
<td>PEO2</td>
<td>Develop human resource with knowledge, abilities and insight in Mathematics and related fields required for career in academia and industry.</td>
</tr>
<tr>
<td>PEO3</td>
<td>Engage in lifelong learning and adapt to changing professional and societal needs.</td>
</tr>
</tbody>
</table>

PROGRAM SPECIFIC OUTCOMES
At the end of the program,

<table>
<thead>
<tr>
<th>PSO1</th>
<th>Students will be able to understand the nature of Mathematics and shall be ready to study higher ‘Abstract Mathematics’.</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSO2</td>
<td>Students will be able to visualize the importance of Mathematics and apply the</td>
</tr>
</tbody>
</table>
knowledge of Mathematics in Physical, Chemical and Social Sciences.

<table>
<thead>
<tr>
<th>PSO3</th>
<th>Students will be able to use latest mathematical tools and software.</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSO4</td>
<td>Students will be able to formulate computer codes to tackle the complex mathematical problems.</td>
</tr>
<tr>
<td>PSO5</td>
<td>Students will become more confident due to enhanced level of reasoning, logics, skills and shall be able to understand the needs of the society.</td>
</tr>
</tbody>
</table>

**PROGRAM OUTCOMES:** At the end of the program, the student will be able to:

<table>
<thead>
<tr>
<th>PO1</th>
<th>Understand the concepts of different branches of Mathematics.</th>
</tr>
</thead>
<tbody>
<tr>
<td>PO2</td>
<td>Demonstrate expertise to conduct wide range of scientific modelling.</td>
</tr>
<tr>
<td>PO3</td>
<td>Apply the concepts of mathematics in areas of mechanics, analysis, calculus, algebra, geometry, mathematical modelling etc., in industry, academia, and day-to-day life.</td>
</tr>
</tbody>
</table>
Scheme of the Program:

SEMESTER FIRST

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Load Allocation</th>
<th>Marks Distribution</th>
<th>Total Marks</th>
<th>Cr</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>L</td>
<td>T</td>
<td>P</td>
<td>Internal</td>
</tr>
<tr>
<td>1.</td>
<td>UC-Bshm-101-19</td>
<td>Calculus -1</td>
<td>4</td>
<td>1</td>
<td></td>
<td>40</td>
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<tr>
<td>2.</td>
<td>UC-Bshm-102-19</td>
<td>Co-ordinate Geometry</td>
<td>4</td>
<td>1</td>
<td></td>
<td>40</td>
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<tr>
<td>3.</td>
<td>UC-Bshm-103-19</td>
<td>Programming Lab-I</td>
<td>-</td>
<td>-</td>
<td>4</td>
<td>30</td>
</tr>
<tr>
<td>4.*</td>
<td>UC-Bshp-112-19</td>
<td>Electricity and Magnetism</td>
<td>3</td>
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<td></td>
<td>UC-Bshp-113-19</td>
<td>Physics Lab-I</td>
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<td></td>
<td>UGCA-1902</td>
<td>Fundamentals of Computer and IT</td>
<td>3</td>
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<td>UGCA-1906</td>
<td>Fundamentals of Computer and IT Laboratory</td>
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<tr>
<td>5.**</td>
<td>UC-Bhcl-I-101-19</td>
<td>Inorganic Chemistry</td>
<td>3</td>
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<td></td>
<td>UC-Bhcp-I-102-19</td>
<td>Chemistry Lab-I</td>
<td>-</td>
<td>-</td>
<td>4</td>
<td>30</td>
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<tr>
<td></td>
<td>BBA-GE 101</td>
<td>Managerial Economics-I</td>
<td>5</td>
<td>1</td>
<td>0</td>
<td>40</td>
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<tr>
<td>6.</td>
<td>UC-Bshl-105-19</td>
<td>Communicative English -I</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>20</td>
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<td>7.</td>
<td>UC-Bshl-106A/106B-19</td>
<td>Punjabi Compulsory-I/ Mudhli Punjabi-I</td>
<td>2</td>
<td>-</td>
<td>-</td>
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</tbody>
</table>

Total 26

L:Lectures  T: Tutorial  P:Practical  Cr: Credits

Note 1*: Physics (UC-Bshp-112-19 & UC-Bshp-113-19) and Chemistry (UC-Bhcl I-101-19 & UC-Bhsp-I-102-19) are compulsory for the Students with Non-Medical background.

Note 2**: Students without Non-medical background may opt Fundamentals of Computer and IT (UGCA-1902 & UGCA-1906) and Managerial Economics-I (BBA-GE-101)
<table>
<thead>
<tr>
<th>S.No.</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Load Allocation</th>
<th>Marks Distribution</th>
<th>Total Marks</th>
<th>Cr</th>
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</thead>
<tbody>
<tr>
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<td>L T P</td>
<td>Internal</td>
<td>External</td>
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<tr>
<td>1.</td>
<td>UC-BSHM-201-19</td>
<td>Calculus-II</td>
<td>4 1 -</td>
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<td>4.*</td>
<td>UC-BSHP-124-19</td>
<td>Waves and Vibrations</td>
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<tr>
<td></td>
<td>UGCA-1909</td>
<td>Object Oriented Programming using C++</td>
<td>3 1 -</td>
<td>40 60</td>
<td>100</td>
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<tr>
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<td>UGCA-1910</td>
<td>Object Oriented Programming using C++ Laboratory</td>
<td>- - 4</td>
<td>60 40</td>
<td>100</td>
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<tr>
<td>5.**</td>
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<td>Organic Chemistry</td>
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<tr>
<td>7.</td>
<td>UC-BHHL-116A/116B-19</td>
<td>Punjabi Compulsory-II/ Mudhli Punjabi-II</td>
<td>2 - -</td>
<td>20 30</td>
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<td>2</td>
</tr>
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<td>Total</td>
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<td></td>
</tr>
</tbody>
</table>

L: Lectures  T: Tutorial  P: Practical  Cr: Credits

Note 1*: Physics (UC-BSHP-112-19 & UC-BSHP-113-19) and Chemistry (UC-BHCL-113-19 & UC-BHCP-119-19) are compulsory for the Students with Non-Medical background.

Note 2**: Students without Non-medical background may opt Object Oriented Programming using C++ (UGCA-1909 & UGCA-1910) and Managerial Economics-II (BBA-GE-201)
## Examination and Evaluation

### Theory

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Evaluation criteria</th>
<th>Weightage in Marks</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mid term/sessional Tests</td>
<td>24</td>
<td>Internal evaluation (40 Marks)</td>
</tr>
<tr>
<td>2</td>
<td>Attendance</td>
<td>6</td>
<td>MSTs, Quizes, assignments, attendance, etc., constitute internal evaluation. Average of two mid semester test will be considered for evaluation.</td>
</tr>
<tr>
<td>3</td>
<td>Assignments</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>End semester examination</td>
<td>60</td>
<td>External evaluation</td>
</tr>
<tr>
<td>5</td>
<td>Total</td>
<td>100</td>
<td>Marks may be rounded off to nearest integer.</td>
</tr>
</tbody>
</table>

### Practical

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Evaluation criteria</th>
<th>Weightage in Marks</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Evaluation of practical record/ Viva Voice/Attendance/Seminar/ Presentation</td>
<td>30</td>
<td>Internal evaluation</td>
</tr>
<tr>
<td>2</td>
<td>Final Practical Performance + Viva-Voce</td>
<td>20</td>
<td>External evaluation</td>
</tr>
<tr>
<td>3</td>
<td>Total</td>
<td>50</td>
<td>Marks may be rounded off to nearest integer.</td>
</tr>
</tbody>
</table>
Instructions for Paper-Setter in B. Sc (Hons.) Mathematics

A. Scope

1. The question papers should be prepared strictly in accordance with the prescribed syllabus and pattern of question paper of the University.

2. The question paper should cover the entire syllabus with uniform distribution among each units and Weightage of marks for each question.

3. The language of questions should be simple, direct, and documented clearly and unequivocally so that the candidates may have no difficulty in appreciating the scope and purpose of the questions. The length of the expected answer should be specified as far as possible in the question itself.

4. The distribution of marks to each question/answer should be indicated in the question paper properly.

B. Type and difficulty level of question papers

1. Questions should be framed in such a way as to test the students intelligent grasp of broad principles and understanding of the applied aspects of the subject. The Weightage of the marks as per the difficulty level of the question paper shall be as follows:

   i) Easy question 30%

   ii) Average questions 50%

   iii) Difficult questions 20%

2. The numerical content of the question paper should be upto 40%.

C. Format of question paper

1. Paper code and Paper-ID should be mentioned properly.

2. The question paper will consist of three sections: Sections-A, B and C.
3. Section-A is COMPULSORY consisting of TEN SHORT questions carrying two marks each (total 20 marks) covering the entire syllabus.

4. The Section-B consists of FOUR questions of eight marks each covering Unit I & II of syllabus (Taking two questions from each unit I & II).

5. The Section-C consists of FOUR questions of eight marks each covering Unit III & IV of syllabus (Taking two questions from each unit III & IV).

6. Sub-parts of the questions in Section B and C should be preferred for numerical/conceptual questions.

7. Attempt any five questions from Section-B and Section-C, selecting at least two questions from each of the two sections.
Question paper pattern for MST:

<table>
<thead>
<tr>
<th>Roll No:</th>
<th>No of pages:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

IK Gujral Punjab Technical University- Jalandhar

Department of Mathematical Sciences

Academic Session:

Mid-Semester Test: I/II/III (Regular/reappear) Date:

Programme: B.Sc.(Hons.) Mathematics Semester:

Course Code: Course:

Maximum Marks: 24 Time: 1 hour 30 minutes

- Note: Section A is compulsory; Attempt any two questions from Section B and one question from Section C.

<table>
<thead>
<tr>
<th>Section: A</th>
<th>Marks</th>
<th>Cos</th>
</tr>
</thead>
<tbody>
<tr>
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</table>

<table>
<thead>
<tr>
<th>Section: B</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
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<td>6</td>
<td>4</td>
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<tr>
<td>7</td>
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</table>

<table>
<thead>
<tr>
<th>Section: C</th>
<th>Marks</th>
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</thead>
<tbody>
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<td>8</td>
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</tr>
<tr>
<td>9</td>
<td>8</td>
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</table>
Details of Course Objectives

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>CO2</td>
<td></td>
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<tr>
<td>CO3</td>
<td></td>
</tr>
<tr>
<td>CO4</td>
<td></td>
</tr>
<tr>
<td>CO5</td>
<td></td>
</tr>
</tbody>
</table>
SEMESTER-I
UC-BSHM-101-19 | Calculus-I | L-4, T-1, P-0 | 4 Credits
---|---|---|---

**Pre-requisite:** Elementary calculus of senior secondary level.

**Course Objectives:** The objectives of this course are to make the students understand the following:

1. The fundamental concepts of differential and integral calculus.
2. The geometrical meaning of functions, limits, continuity, derivatives, mean value theorems.
3. Applications of derivatives and sketching of curves.
4. The definition of Integral calculus and its basic applications.
5. The relation between derivative and the integration of a function.

**Course Outcomes:** At the end of the course, the students will be able to

| CO1 | Understand the basic concepts of Differential and Integral Calculus. |
| CO2 | Visualize all concepts geometrically. |
| CO3 | Sketch curves of the functions intuitively with the help of Differential Calculus. |
| CO4 | Apply the knowledge of Differential and Integral Calculus. |
| CO5 | Understand the fundamental relation between differential and Integral Calculus. |

**Mapping of course outcomes with the program outcomes**

<table>
<thead>
<tr>
<th></th>
<th>PSO 1</th>
<th>PSO 2</th>
<th>PSO 3</th>
<th>PSO 4</th>
<th>PSO 5</th>
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<tbody>
<tr>
<td>CO1</td>
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</tr>
<tr>
<td>CO3</td>
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<tr>
<td>CO4</td>
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<tr>
<td>CO5</td>
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<td>2</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>
Course Title: Calculus-I
Course Code: UC-BSHM-101-19

UNIT-I
Real line, intervals, order properties of real numbers, the least upper bound and the greatest lower bound properties, Archimedean property. Functions, Graphs of functions, Exponential functions, Inverse functions and Logarithmic functions, implicitly defined functions, some special functions, one-one functions, onto functions, composition of functions, limit of a function, calculating limits through limit laws, The precise definition of limit (\(\varepsilon-\delta\) definition), continuity, limit at infinity, asymptotes, continuous functions and classification of discontinuities, uniform continuity.

UNIT-II
Derivative of a function, the derivative as a function, derivatives of polynomials and exponential functions, the product and quotient rules, rates of change in natural and social sciences, derivatives of trigonometric, inverse trigonometric, logarithmic and hyperbolic functions, the chain rule, implicit differentiation, higher derivatives, preliminary transformations, differentiation of determinants.

UNIT-III
Application of derivative: maximum and minimum values, increasing and decreasing functions, mean value theorems, Intermediate value theorems, How derivatives affect the shape of graph, L’ Hospital’s rule, concavity and convexity, the second derivative test, points of inflexion, Rolle’s theorem, Lagrange’s theorem, Cauchy’s mean value theorem.

UNIT-IV
Higher order derivatives, calculation to the \(n^{th}\) derivative, determination of \(n^{th}\) derivative of rational functions. The \(n^{th}\) derivative of the products of power of sines and cosines, Leibnitz’s theorem, the \(n^{th}\) derivative of the product of two functions, Maclaurin’s theorem, Taylor’s theorem.

TEXT BOOKS
- Shanti Narayan and P. K. Mittal, Differential Calculus, S. Chand, 2015

RECOMMENDED BOOKS:
UC-BSHM-102-19 Co-ordinate Geometry L-4, T-1, P-0 4 Credits

Pre-requisite: A basic knowledge of two-dimensional Cartesian plane.

Course Objectives: This course is designed to introduce the geometry of two dimensions. The major focus of this course will be on geometric definition of two-dimensional shapes and a rigorous discussion on their properties and use.

Course Outcomes: At the end of the course, the students will be able to

| CO1     | Explain the different types of plane figures. |
| CO2     | Visualize two-dimensional shapes geometrically. |
| CO3     | Apply the knowledge of geometry of two dimensions in advance courses in mathematics. |
| CO4     | Explain the Cartesian and Polar coordinate systems to study two dimensional shapes. |
| CO5     | Study further the geometry of three dimensions. |

Mapping of course outcomes with the program outcomes

<table>
<thead>
<tr>
<th></th>
<th>PSO 1</th>
<th>PSO 2</th>
<th>PSO 3</th>
<th>PSO 4</th>
<th>PSO 5</th>
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<tr>
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<tr>
<td>CO4</td>
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<td>CO5</td>
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</table>
Course Title: Co-ordinate Geometry  
Course Code: UC-BSHM-102-19

UNIT-I

Joint equation of pair of straight lines and angle between them, condition of parallelism and perpendicularity, joint equation of the angle bisectors, joint equation of lines joining origin to the intersection of a line and a curve.

UNIT-II

General equation of circle, circle through intersection of two lines, tangent and normal, Chord of contact, pole and polar, pair of tangents from a point, equation of chord in midpoint form, angle of intersection and orthogonality, power of a point w.r.t. circle, radical axis, co-axial family of circles, limiting points.

UNIT-III

Parabola, ellipse and hyperbola, tangent and normal, chord of contact, pole and polar of tangent from a point, equation of chord in terms of midpoint, diameter, conjugate diameters of ellipse and hyperbola, conjugate hyperbola, asymptotes of hyperbola, rectangular hyperbola.

UNIT-IV

Transformation of axes in two dimensions: shifting of origin, rotation of axes, the second degree equation $S = ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$, its invariants $t$, $\Delta$ and $O$. Reduction of the second degree equation into standard form. Identification of curves represented by $S=0$ (including pair of lines). Polar equations of straight lines, circles and conics. Polar equation of chords, tangent and normal.

TEXT BOOKS


RECOMMENDED BOOKS:

Programming Lab-I  
L-0, T-0, P-2  
2 Credits

Pre-requisite: Knowledge of basic concepts in Mathematics, such as, graphs, functions, conics, matrices etc.

Course Objectives: This course is designed to introduce the basic knowledge of computer programming to simple algebraic operations on matrices and to visualize the geometry of curves and conics in two dimensions. The major focus of this course will be on geometric definition of two-dimensional shapes and a rigorous discussion on their properties and use.

Course Outcomes: At the end of the course, the students will be able to

CO1  Explain the basic concepts of programming.
CO2  Apply the knowledge of programming in different Matrix Operations.
CO3  Use programming in plotting and visualization of graphs of algebraic and transcendental functions.
CO4  Obtain Surface of revolution of curves.
CO5  Study further the tracing of conics.

Mapping of course outcomes with the program outcomes

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</table>
Course Title: Programming Lab-I
Course Code: UC-BSHM-103-19

The following programs with following methods are to be practiced to:

i) Introduce the programming through (FORTRAN, C etc.)
ii) Perform Matrix Operations, such as, Addition, Multiplication, inverse, Transpose etc.
iii) Plot the graphs of algebraic and transcendental functions (For example, $e^{ax+b}$, $\log(ax + b)$, $\frac{1}{ax+b}$ with constants a, b, etc.)
iv) Obtain the surface of revolution of curves.
v) Trace of conics in Cartesian Coordinates /Polar Coordinates.
vi) Applications of derivative.

RECOMMENDED BOOKS:

### UC-BSHP-112-19
**Electricity and Magnetism**
L-3, T-1, P-0  
4 Credits

**Pre-requisite:** Basic knowledge of Electricity and Magnetism at high school level.

**Course Objectives:** The objective of the course is to expose the students to the formal structure of electricity and magnetism so that they can use these as per their requirement.

**Course Outcomes:** At the end of the course, the student will be able to

<table>
<thead>
<tr>
<th>CO1</th>
<th>Understand and describe the different concepts of electromagnetism</th>
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<tbody>
<tr>
<td>CO2</td>
<td>To obtain the electric and magnetic fields for simple configurations under static conditions.</td>
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<tr>
<td>CO3</td>
<td>To analyse time varying electric and magnetic fields.</td>
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<td>CO4</td>
<td>To understand Maxwell’s equation in different forms and different media.</td>
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<tr>
<td>CO5</td>
<td>have a solid foundation in fundamentals required to solve problems and also to pursue higher studies.</td>
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#### Mapping of course outcomes with the program outcomes

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Course Title: Electricity and Magnetism  
Course Code: UC-BSHP-112-19

UNIT-I

Review of Vector Analysis: Vector algebra, scalar and vector product; Concept of Fields; scalar and vector field; gradient, divergence and curl and their physical significance; Conservative field, Line, surface and volume integral of a vector field, Gauss-divergence theorem and Stoke’s theorem.

UNIT II

Electrostatics: Electrostatic field; electric flux; Gauss’s law in differential and integral form; Applications of Gauss law-Electric filed due to point charge, infinite line of charge, uniformly charged spherical shell and solid sphere, plane charge sheet; Electric potential as line integral of electric field, potential due to point charge and electric dipole; calculation of electric field from potential; Poisson’s equation and Laplace’s equation(Cartesian coordinate); Capacitance; capacitance of a spherical conductor and cylindrical capacitor, Energy per unit volume in electrostatic field, Dielectric medium, dielectric polarization and its types, Displacement vector, Boundary conditions.

UNIT-III

Magnetostatics: Magnetic flux; magnetic flux density; Faraday’s law; magnetomotive force; Biot-Savart’s law and its applications-straight conductor, circular coil, divergence and curl of magnetic field; Ampere’s Circuital law in differential and integral form; Magnetic vector potential; ampere’s force law; magnetic vector potential; Energy stored in a magnetic field, boundary conditions on magnetic fields.

UNIT-IV

Maxwell’s Equations and Electromagnetic Waves: Equation of continuity for time varying fields; Inconsistency of ampere’s law; concept of sinusoidal time variations (Phasor notation); Maxwell’s equations in differential and integral form, physical significance; Maxwell equations in free space, static field and in Phasor notation; Difference between displacement current and conduction current; Wave equation in free space and in homogenous medium, Concept of Poynting vector; Poynting Theorem.

RECOMMENDED BOOKS:

- Kraus John D, Electromagnetics, McGraw-Hill Publisher
- W. Saslow, Electricity, magnetism and light, Academic Press
- A Textbook of Electricity and Magnetism, S K Sharma, Shalini Sharma, S Dinesh & Co.
Pre-requisite (If any): High-school education

Course Objectives: The aim and objective of the lab course is to introduce the students to the formal structure of electromagnetism and phenomenon of wave optics so that they can use these as per their requirement.

Course Outcomes: At the end of the course, the student will be able to

CO1 Able to verify the theoretical concepts/laws learnt in theory courses.

CO2 Trained in carrying out precise measurements and handling sensitive equipment.

CO3 Understand the methods used for estimating and dealing with experimental uncertainties and systematic “errors”.

CO4 Learn to draw conclusions from data and develop skills in experimental design.

CO5 Document a technical report which communicates scientific information in a clear and concise manner.

Mapping of course outcomes with the program outcomes

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Course Title: Physics Lab-I  
Course Code: UC-BSHP-113-19  

Note: Students are expected to perform about 8-10 experiments from the following list, selecting minimum of 6-7 from the Physical Lab and 2-3 from the Virtual lab.

List of experiments:

1. Use a Multimeter for measuring (a) Resistances, (b) AC and DC Voltages, (c) DC Current, (d) Capacitances, and (e) Checking electrical fuses.
2. To study the laser beam characteristics like; wave length, aperture, spot size, etc. using diffraction grating.
3. To study the diffraction using laser beam and thus to determine the grating element.
4. To study wavelength and laser interference using Michelson’s Interferometer.
5. To find the refractive index of a material/glass using spectrometer.
6. To find the refractive index of a liquid using spectrometer.
7. To determine the resolving power of a prism.
8. To study the magnetic field of a circular coil carrying current using a Steward and Gees Tangent Galvanometer.
9. Determine the radius of circular coil using the Circular coil.
10. To study B-H curve using CRO.
11. To find out polarizability of a dielectric substance.
12. To find out the horizontal component of earth’s magnetic field ($B_h$).

RECOMMENDED BOOKS:

- Engineering Practical Physics, S. Panigrahi & B. Mallick, 2015, Cengage Learning India Pvt. Ltd.
- Practical Physics, C L Arora. S. Chand & Company Ltd.
- http://www.vlab.co.in
**UGCA-1902** Fundamentals of Computer and IT | L-3, T-1, P-0 | 4 Credits

**Pre-requisite:** NA

**Course Outcomes:** At the end of the course, the student will be able to

| CO1 | Understanding the concept of input and output devices of Computers |
| CO2 | Learn the functional units and classify types of computers, how they process information and how individual computers interact with other computing systems and devices. |
| CO3 | Understand an operating system and its working, and solve common problems related to operating systems |
| CO4 | Learn basic word processing, Spreadsheet and Presentation Graphics Software skills. |
| CO5 | Study to use the Internet safely, legally, and responsibly |
Course Title: Fundamentals of Computer and IT  
Course Code: UGCA-1902

UNIT-I

**Human Computer Interface:** Concepts of Hardware and Software; Data and Information.  
**Functional Units of Computer System:** CPU, registers, system bus, main memory unit, cache memory, Inside a computer, SMPS, Motherboard, Ports and Interfaces, expansion cards, ribbon cables, memory chips, processors.  
**Devices:** Input and output devices (with connections and practical demo), keyboard, mouse, joystick, scanner, OCR, OMR, bar code reader, web camera, monitor, printer, plotter.  
**Data Representation:** Bit, Byte, Binary, Decimal, Hexadecimal, and Octal Systems, Conversions and Binary Arithmetic (Addition/ Subtraction/ Multiplication) Applications of IT.

UNIT II

**Concept of Computing, Types of Languages:** Machine, assembly and High level Language; Operating system as user interface, utility programs.  
**Word processing:** Editing features, formatting features, saving, printing, table handling, page settings, spell-checking, macros, mail-merge, equation editors.

UNIT-III

**Spreadsheet:** Workbook, worksheets, data types, operators, cell formats, freeze panes, editing features, formatting features, creating formulas, using formulas, cell references, replication, sorting, filtering, functions, Charts & Graphs.  
**Presentation Graphics Software:** Templates, views, formatting slide, slides with graphs, animation, using special features, presenting slide shows.

UNIT-IV

**Electronic Payment System:** Secure Electronic Transaction, Types of Payment System: Digital Cash, Electronic Cheque, Smart Card, Credit/Debit Card E-Money, Bit Coins and Crypto currency, Electronic Fund Transfer (EFT),Unified Payment Interface(UPI), Immediate Payment System(IMPS), Digital Signature and Certification Authority. Introduction to Bluetooth, Cloud Computing, Big Data, Data Mining, Mobile Computing and Embedded Systems and Internet of Things (IoT).  

RECOMMENDED BOOKS:

- Introduction to Information Technology, ITL Education Solutions limited, Pearson Education  
- IT Tools, R.K. Jain, Khanna PublishingHouse
• “Introduction to Computers”, Peter Norton
• Problem Solving Cases in Microsoft Excel, Joseph Brady & Ellen Monk, Thomas Learning
• www.sakshat.ac.in
• https://swayam.gov.in/course/4067-computer-fundamentals
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<td>Pre-requisite (If any): NA</td>
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- **CO1**: Familiarizing with Open Office (Word processing, Spreadsheets and Presentation).
- **CO2**: To acquire knowledge on editor, spread sheet and presentation software.
- **CO3**: The students will be able to perform documentation and accounting operations.
- **CO4**: Students can learn how to perform presentation skills.
Course Title: Fundamentals of Computer and IT Laboratory

Course Code: UGCA-1906

List of experiments:

- **Word Orientation:** The instructor needs to give an overview of word processor. Details of the four tasks and features that would be covered Using word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter.
  
  1) Using word to create Resume:
     Features to be covered:- Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in Word.
  
  2) Creating an Assignment
     Features to be covered:- Formatting Styles, inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.
  
  3) Creating a Newsletter
     Features to be covered :- Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes and Paragraphs
  
  4) Creating a Feedback form
     Features to be covered :- Forms, Text Fields, Inserting objects, Mail Merge in Word.

- **Excel Orientation:** The instructor needs to tell the importance of Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered Excel - Accessing, overview of toolbars, saving excel files.
  
  1) Creating a Scheduler
     Features to be covered :- Gridlines, Format Cells, Summation, auto fill, Formatting Text
  
  2) Creating an Assignment
     Features to be covered:- Formatting Styles, inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.
  
  3) Creating a Newsletter
     Features to be covered :- Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes and Paragraphs
  
  4) Creating a Feedback form
     Features to be covered :- Forms, Text Fields, Inserting objects, Mail Merge in Word.

- **Presentation Orientation:**
  
  1) Students will be working on basic power point utilities and tools which help them create basic power point presentation.
Topic covered includes :- PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows
2) This session helps students in making their presentations interactive. Topics covered includes: Hyperlinks, Inserting Images, ClipArt, Audio, Video, Objects, Tables and Charts
3) Concentrating on the in and out of Microsoft power point. Helps them learn best practices in designing and preparing power point presentation. Topics covered includes: - Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), Inserting – Background, textures, Design Templates, Hidden slides, Auto content wizard, Slide Transition, Custom
4) Animation, Auto Rehearsing
5) Power point test would be conducted. Students will be given model power point presentation which needs to be replicated

- **Internet and its Applications:** The instructor needs to tell the how to configure Web Browser and to use search engines by defining search criteria using Search Engines
  1) To learn to setup an e-mail account and send and receive e-mails.
  2) To learn to subscribe/post on a blog and to use torrents for accelerated downloads.
  3) Hands on experience in online banking and Making an online payment for any domestic bill.

**RECOMMENDED BOOKS:**

- Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.
- Introduction to information technology, Turban, Rainer and Potter, John Wiley and Sons.
- Problem Solving Cases in Microsoft Excel, Joseph Brady & Ellen F Monks, Thoms on Learning.
Course Title: Inorganic Chemistry  
Course Code: UC-BSHC-101-19

UNIT-I


UNIT-II

Chemical Bonding-I: Ionic bond: General characteristics, types of ions, size effects, radius ratio rule and its limitations, Packing of ions in crystals, Born-Landé equation with derivation and importance of Kapustinskii expression for lattice energy. Madelung constant, Born-Haber cycle and its application, Solvation energy, Metallic Bond: Qualitative idea of valence bond and band theories. Semiconductors and insulators, defects in solids, Weak Chemical Forces: van der Waals forces, ion-dipole forces, dipole-dipole interactions, induced dipole interactions, Instantaneous dipole-induced dipole interactions. Repulsive forces, Hydrogen bonding (theories of hydrogen bonding, valence bond treatment), Effects of chemical force, melting and boiling points, solubility energetics of dissolution process.

UNIT-III

Chemical Bonding-II: Covalent bond: Lewis structure, Valence Bond theory (Heitler-London approach), Energetics of hybridization, equivalent and non-equivalent hybrid orbitals. Bent’s rule, Resonance and resonance energy, Molecular orbital theory. Molecular orbital diagrams of diatomic and simple polyatomic molecules $N_2$, $O_2$, $C_2$, $B_2$, $F_2$, $CO$, $NO$, and their ions; $HCl$, $BeF_2$, $CO_2$, (idea of s-p mixing and orbital interaction to be given). Formal charge, Valenceshell electron pair repulsion theory (VSEPR), shapes of simple molecules and ions containing lone pairs and bond pairs of electrons, multiple bonding ($\sigma$ and $\pi$ bond approach) and bond lengths, Covalent character in ionic compounds, polarizing power and polarizability. Fajan’s rules and consequences of polarization. Ionic character in covalent compounds: Bond moment and dipole moment. Percentage ionic character from dipole moment and electronegativity difference.

UNIT-IV

Chemistry of s and p Block Elements: Inert pair effect, Relative stability of different oxidation states, diagonal relationship and anomalous behaviour of first member of each group, Allotropy and catenation, Complex formation tendency of s and p block elements, Hydrides and their classification ionic, covalent and interstitial, Basic beryllium acetate and nitrate. Study of the following compounds with emphasis on structure, bonding, preparation, properties and uses, Boric acid and borates, boron nitrides, borohydrides (diborane) carbonaranes and graphitic
compounds, silanes, Oxides and oxoacids of nitrogen, Phosphorus and chlorine, Peroxo acids of sulphur, interhalogen compounds, polyhalide ions, pseudohalogens and basic properties of halogens.

**RECOMMENDED BOOKS:**

- Shriver & Atkins, Inorganic Chemistry 5th Ed.
Course Title: Chemistry Lab-I
Course Code: UC-BSHC-102-19

List of Experiments:

(A) Titrimetric Analysis

(i) Calibration and use of apparatus

(ii) Preparation of solutions of different Molarity/Normality of titrants

(B) Acid-Base Titrations

(i) Estimation of carbonate and hydroxide present together in mixture.

(ii) Estimation of carbonate and bicarbonate present together in a mixture.

(iii) Estimation of free alkali present in different soaps/detergents

(C) Oxidation-Reduction Titrimetry

(i) Estimation of Fe(II) and oxalic acid using standardized KMnO4 solution.

(ii) Estimation of oxalic acid and sodium oxalate in a given mixture.

(iii) Estimation of Fe(II) with K₂Cr₂O₇ using internal (diphenylamine, anthranilicacid) and external indicator.

Reference text:

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<tr>
<th>BBA-GE101-18</th>
<th>Managerial Economics I</th>
<th>L-5, T-1, P-0</th>
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**Pre-requisite:** Understanding of basic knowledge of Managerial Economics

**Course Objectives:** The primary objective of this course is to equip students with the necessary economic concepts, principles, theory and techniques and enhance their managerial decision making to address business problems in a globalized economic environment.

**Course Outcomes:** After completion of the course, the students shall be able to:

| CO1 | Understand the basic concepts of managerial economics and apply the economic way of thinking to individual decisions and business decisions. |
| CO2 | Measure price elasticity of demand, understand the determinants of elasticity and apply the concepts of price, cross and income elasticity of demand. |
| CO3 | Understand and estimate production function and Law of Diminishing Marginal Utility. |
| CO4 | Understand and explain four basic market models of perfect competition, monopoly, monopolistic competition, and oligopoly, and how price and quantity are determined in each model. |
| CO5 | Understand the different costs of production and how they affect short and long run decisions. |
Course Title: Managerial Economics I
Course Code: BBA-GE101-18

UNIT-I


Demand and the Firm: Demand and its Determination: Demand function; Determinants of demand; Demand elasticity – Price, Income and cross elasticity. Use of elasticity for analyzing demand, Demand estimation, Demand forecasting, Demand forecasting of new product.

Indifference Curve Analysis: Meaning, Assumptions, Properties, Consumer Equilibrium, Importance of Indifference Analysis, Limitations of Indifference Theory

UNIT-II

Production Function: Production function Meaning, Concept of productivity and technology, Short Run and long run production function Isoquants; Least cost combination of inputs, Producer’s equilibrium; Return to scale; Estimation of production function.

Theory of Cost: Cost Concepts and Determinants of cost, short run and long run cost theory, Modern Theory of Cost, Relationship between cost and production function

UNIT-III

Revenue Curve: Concept of Revenue, Different Types of Revenues, concept and shapes of Total Revenue, Average revenue and marginal revenue, Relationship between Total Revenue, Average revenue and marginal revenue, Elasticity of Demand and Revenue relation


UNIT-IV

Pricing: Pricing practices; Commodity Pricing: Economics of advertisement costs; Types of pricing practices

Factor Pricing: Demand and supply of factor of production; Collective bargaining, Concept of rent, profit, interest- Rate of return and interest rates; Real vs. Nominal interest rates. Basic capital theory–Interest rate and return on capital. Measurement of profit.

Note: Relevant Case Studies will be discussed in class.

RECOMMENDED BOOKS:

- K.K. Dewett, Modern Economic Theory, S. Chand Publication
- D.M. Mithani, Managerial Economics Theory and Applications, Himalaya Publication
- Peterson and Lewis, Managerial Economics, Prentice Hall of India
- Gupta, Managerial Economics, Tata McGraw Hills
- Geetika, Managerial Economics, Tata McGraw Hills
• D.N.Dwivedi, *Managerial Economic*, Vikas Publications
• Froeb, *Managerial Economics*, Cengage Learning
• Thomas Christopher R., and Maurice S. Charles, Managerial Economics – Concepts and Applications, 8th Edition,
• Mehta, P. L, Managerial Economics – Analysis, Problems and Cases, Sultan Chand & Sons, Delhi.
• Shapiro, Macro Economics, Galgotia Publications.
Pre-requisite: Basic proficiency in Communication Skills

Course Objectives: The main objective of this course is:
- To help the students become proficient in LSRW-Listening, Speaking, Reading & Writing skills
- To help the students become the independent users of English language
- To develop in them vital communication skills, integral to their personal, social and professional interactions
- To teach them the appropriate language of professional communication
- To prepare them for job market

Course Outcomes: At the end of the course, the student will

| CO1 | acquire basic proficiency in reading & listening, writing and speaking skills |
| CO2 | be able to understand spoken and written English language, particularly the language of their chosen technical field. |
| CO3 | be able to converse fluently. |
| CO4 | be able to produce on their own clear and coherent texts. |
| CO5 | become proficient in professional communication, such as, interviews, group discussions, office environments, important reading skills as well as writing skills and thereby will have better job prospects. |

Mapping of course outcomes with the program outcomes

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</tbody>
</table>
Course Title: Communicative English -I  
Course Code: UC-BSHL-105-19

UNIT I (Literature)


The following poems from this anthology are prescribed:

1. Pippa's Song: Robert Browning
2. Apparently With No Surprise: Emily Dickinson
3. Fool and Flea: Jeet Thayil

(B) Prose Parables (Orient Black Swan, 2013)

The following stories from the above volume are prescribed:

a. The Kabuliwallah: Rabindranath Tagore
b. The Eyes Are Not Here: Ruskin Bond
c. Grief: Anton Chekov

UNIT-II

Vocabulary: Word Formation Processes; Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives; Synonyms, antonyms

Grammar: Subject-verb agreement; Noun-pronoun agreement; Misplaced modifiers; Articles Determiners; Modals; Prepositions;

UNIT-III

Reading and Understanding: Close Reading; Comprehension;

UNIT-IV

Mechanics of Writing & Speaking Skills

Essay Writing (Descriptive/Narrative/Argumentative); Business letters; Précis Writing; Self Introductions; Group Discussion
RECOMMENDED BOOKS:

Pre-requisite: Understanding of senior secondary level Punjabi

Course Objectives: The objective of the course is:
1. To enhance the language ability of students.
2. To enhance the ability of Learning science and developing science literacy through local language teaching with science subjects.

Course Outcomes: At the end of the course, the student will be able to

| CO1 | Translate and transfer/broadcast the western scientific knowledge in the local language. |
| CO2 | Translate and transfer the indigenous/traditional scientific knowledge available in local knowledge into English and other global languages. |
| CO3 | Understand the society through Punjabi language, literature and culture |
| CO4 | Learning science and in developing science literacy. |
| CO5 | Improve the internal communication. |
UNIT-I

ਕਿਵਤਾਭਾਗ:

ਭਾਈਵੀਸੰਘ:

ਸਮਾਂ, ਚਸ਼ਮਾ

ਪੰਜਾਬੀਲਾਜ਼ਮੀ, ਟੀਚਾਪੂਰਾਣੀ

ਪੰਜਾਬਨੂੰਕੂਕਾਂਮਥ, ਹੱਲਵਾਹੁਣਵਾਲੇ

ਪੰਜਾਬਨੂੰਕੂਕਾਂਮਥ, ਅੰਨਦਾਤਾ

UNIT-II

ਕਹਾਣੀਭਾਗ:

ਸੰਤਿਸੰਘਸੇਖੀ:

ਪੇਨੀਦੀਨਆਣੇ

ਸੁਜਾਨਿਸੰਘ:

ਕੁਲਫੀ

ਕੁਲਵੰਤਿਸੰਘਿਵਰਕ:

ਤੂੜੀਦੀਪਰੰਗੀ

ਗੁਰਿਦਆਲਿਸੰਘ:

ਸਾਂਝ

UNIT-III

ਭਾਸ਼ਾਦਾਟਕਸਾਲੂਰੂਪ, ਭਾਸ਼ਾਤੇਉਪ-

ਭਾਸ਼ਾਵਚਅੰਤਰ, ਪੰਜਾਬੀਦੀਆਂਉਪ-

ਪੰਜਾਬੀਭਾਸ਼ਾ:

ਿਨਕਾਸਤੇਿਵਕਾਸ।
UNIT-IV

ਸੰਖੇਪਰਚਨਾ (ਪੰਜਾਬੀ)

ਪੈਰਚਨਾ

ਸਰਲਅੰਗਰੇਜ਼ੀਪੈਰੇਦਾਪੰਜਾਬੀਅਨੁਵਾਦ

RECOMMENDED BOOKS:

- ਮਹਿਦਾ.ਭਿਰਿਸ਼ ਨਿੰਧ, ਮਾਣਮਾਰ ਦੇ ਲੱਖਾ, ਤੌਦੀ ਮਾਣਸ ਦੂਰਮੁਤਰ, ਅਭੀਐਂਉਮਰ, 2016.
**Course Objectives:** The objective of the course is to:
1. enhance the language ability of students.
2. enhance the ability of Learning science and developing science literacy through local language teaching with science subjects.

**Course Outcomes:** At the end of the course, the student will be able to

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<th>CO1</th>
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<td>Translate and transfer the indigenous/traditional scientific knowledge available in local knowledge into English and other global languages.</td>
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<tr>
<td>CO3</td>
<td>Understand the society through Punjabi language, literature and culture.</td>
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<tr>
<td>CO4</td>
<td>Learning science and in developing science literacy.</td>
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<tr>
<td>CO5</td>
<td>Improve the internal communication.</td>
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</tbody>
</table>
Course Title: (Mudhli Punjabi)-I  
Course Code: UC-BSHL-106B-19  

UNIT-I  
ਪੈਠੀ ਅੰਤਤੀ (ਦਰਨਾਲਾਅਕ), ਗੋਬਾਲ ਦੀਪ  
ਅਗਾਧਾਂ: ਮੁਢਲੀ ਸਤਕ-ਖੁਦਾਟ  
ਸਾਜਾਧਾਰ: ਚੰਨੀ, ਰਿੰਦੀ, ਅਧਵ  

UNIT-II  
ਪੰਜਾਬੀ ਸਵਰਦੀ ਖੋਜਾ: ਮੁਢਲੀ ਸਤਕ-ਖੁਦਾਟ  
ਮੁਢ ਸਵਰਦੀ, ਅੰਡੀਕਾਰ, ਪਰੀਣੀਤਾ  
ਸਮਾਨਾਰਥ ਸਵਰਦੀ, ਵਿਰਔਰਥਕ ਸਵਰਦੀ  
ਸਰੱਪ- ਅਸਰੂੰ: ਰੇਤੀ ਪੇਦੀ ਰੇਤੀ ਆਸ਼ੂੰਪ ਸਵਰਦੀ ਟੁ ਸਰੱਪ ਬਰਤਹਾ  

UNIT-III  
ਬਰਤਹਾ ਦੇ ਸੌ ਦੀਨਾਂ ਦੇ ਨਾਂ  
ਮਹੀਤੀ ਦੇ ਨਾਂ  
ਰੁਤਾਂ ਦੇ ਨਾਂ  
ਰੀਚ ਮੇੱਂ ਉੱਂ ਦੀਟਾਈ ਸਵਰਦੀ ਰੀਚ  

UNIT-IV  
ਸੰਕਾਲ ਸਵਰਦੀ ਦਾ ਅੰਗਰੇਜ਼ੀ ਪੰਜਾਬੀ ਅਨੁਵਾਦ  
ਸੰਕਾਲ ਸਵਰਦੀ ਦਾ ਪੰਜਾਬੀ ਅੰਗਰੇਜ਼ੀ ਅਨੁਵਾਦ  
ਸੰਕਾਲਚਾਰਾ (ਪ੍ਰੋਪੀ)  
ਪ੍ਰੋਪੀ  
ਸਵਰਦੀਮੇਂਦਰੀਦਮੇਂਦਰੀਪ੍ਰੋਪੀਦਮੇਂਦਰੀਸਵਰਦੀਪ੍ਰੋਪੀ  

Text and Reference Books  
1.ਸੁਖਿਵੰਦਰ ਸੰਸਧੀ, ਪੰਜਾਬੀ ਬਾਨਾ ਰੋਜਵਾਲਾ, ਪੰਜਾਬੀ ਬਾਨਾ ਅਲਾਵਾਈ ਸਰੱਪਾਟ
SEMESTER-II
Pre-requisite: Calculus-I

Course Objectives: The objectives of this course are to make the students understand the following:

1. The applications of differential calculus for tracing curves.
2. The concept of Integration and its definition as limit of sum and area under curve.
3. The relation between derivative and the integration of a function.
4. The concept of improper integrals.
5. Numerical techniques to find approximate integrals and applications of integration for length of arc, finding area and volume.

Course Outcomes: At the end of the course, the students will be able to

- **CO1**: Understand the techniques to sketch a curve using the concepts of differential calculus.
- **CO2**: Visualize all concepts of differential calculus geometrically.
- **CO3**: Understand the concept of Integration.
- **CO4**: Understand the fundamental relation between differential and Integral Calculus.
- **CO5**: Apply the knowledge of integral calculus in finding length of arc, area under curves, volume and area of surface swept by curve during revolution.

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<th>Mapping of course outcomes with the program outcomes</th>
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</table>
Course Title: Calculus-II  
Course Code: UC-BSHM-201-19

UNIT-I  
Concavity and Convexity, points of inflexion, derivative of arc, radius of curvature, centre of curvature, chord of curvature, evolutes and involutes.

UNIT-II  
Asymptotes, working rules of determining Asymptotes, Asymptotes in polar co-ordinates, Cusps, curve tracing (Cartesian and polar), introduction to envelopes.

UNIT-III  
Anti derivative of function of real variable, Riemann sums, definite integrals and their properties, Indefinite integral and net change, the fundamental theorem of calculus, Improper Integrals: Infinite Integrals, Discontinuous intervals, comparison test for improper integrals (Scope: James Stewart; Chapter-), reduction formulae.

UNIT-IV  
Approximate Integration: Midpoint rule, Trapezoidal rule, Simpson’s rule; applications of integrals to find length of arc and area between curves, finding volumes, area of surface of revolution.

TEXT BOOKS  
- Shanti Narayan and P. K. Mittal: Differential Calculus, S. Chand

REFERENCE BOOKS  
Solid Geometry | L-4, T-1, P-0 | 4 Credits
---|---|---

**UC-BSHM-202-19**

**Pre-requisite:** Two dimensional coordinate geometry.

**Course Objectives:** This course is designed to introduce the geometry of three dimensions. The major focus of this course will be on geometric interpretation of three-dimensional shapes and a rigorous discussion on their properties and use.

**Course Outcomes:** At the end of the course, the students will be able to

| CO1 | Use the idea of three-dimensional Cartesian coordinate system, shift of origin and rotation of axes. |
| CO2 | Demonstrate knowledge and understanding of three dimensional shapes and their properties. |
| CO3 | Visualize the three dimensional shapes, for example sphere, cylinder and cone etc. |
| CO4 | Utilize the knowledge of geometry of three dimensions in other branches of mathematics, for example calculus and analysis. |

**Mapping of course outcomes with the program outcomes**

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</table>
Course Title: Solid Geometry  
Course Code: UC-BSHM-202-19

UNIT-I

Lines and planes in 3-dimension, change of axes, shift of origin, rotation of axes, sphere, and section of a sphere by a plane. Sphere through a given circle. Intersection of a line and sphere.

UNIT-II

Tangent and normal, tangent plane, angle of intersection of two spheres and condition of orthogonality, power of a point w.r.t. a sphere, Radical planes, radical axis, radical centre, coaxial family of spheres, limiting points.

UNIT-III

Cylinder, Cone, homogeneous equation of second degree in $x, y, z$, reciprocal cone, right circular and elliptic cones, surface of revolution, enveloping cones, right circular and elliptic cylinders. Hyperbolic cylinder.

UNIT-IV

Quadratic surfaces: Ellipsoid, hyperboloid, paraboloid, quadratic cone, tangent plane and normal.

REFERENCE BOOKS

Pre-requisite: Knowledge of basic concepts in Mathematics such as graphs, functions, conics, matrices etc.

Course Objectives: This course is designed to introduce a Computer Algebra System: MATLAB which is currently used in scientific computations. The main focus will be on introduction to basic concepts of MATLAB using simple examples.

Course Outcomes: At the end of the course, the students will be able to

| CO1 | Explain the basic concepts of programming |
| CO2 | Visualize functions in 2-D and 3-D |
| CO3 | Make their own computer programs for solving problems of their interest |
| CO4 | Use symbolic tools of MATLAB for solving problems arising in various fields of applications |

Mapping of course outcomes with the program outcomes

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</table>
Course Title: Computer Algebra System: MATLAB

Course Code: UC-BSHM-203-19

UNIT-I

The MATLAB environment, scalars, variables, arrays, mathematical operations with arrays, built-in and user defined functions, graphics: two-dimensional and three-dimensional, m-files: script and function files, functions: input; disp and fprintf, relational and logical operators.

UNIT-II

Symbolic math: symbolic objects and expressions; collect; expand; factor; simplify; solve; diff and int commands, Programming: if-end structure; if-else-end structure; loops: for-end and while-end.

Reference Books.

Waves and Vibrations

Pre-requisite: Understanding of senior secondary level Physics and Mathematics

Course Objectives: The objective of the course is to develop basic understanding of Interference, Diffraction and Polarization among students. The Students also learn about the LASER and its applications. Students will be equipped with knowledge to measure wavelength, refractive index and other related parameters, which will act as a strong background if he/she chooses to pursue sciences as a career.

Course Outcomes: At the end of the course, the student will be able to

<table>
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<tr>
<th>CO1</th>
<th>Identify and illustrate physical concepts and terminology used in optics and other related wave phenomena</th>
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<tr>
<td>CO2</td>
<td>Analyze and understand the phenomenon of interference, and diffraction and their applications</td>
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<td>CO3</td>
<td>Get thorough knowledge of the polarization of light and its changes upon reflection and transmission and will learn to analyze the polarization in optical systems.</td>
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<td>CO4</td>
<td>Understand the simple harmonic motion and its application.</td>
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<td>CO5</td>
<td>Describe the different types of lasers, its principle, properties of laser beam.</td>
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Mapping of course outcomes with the program outcomes

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</table>
Course Title: Waves and Vibrations  
Course Code: UC-BSHP-124-19

UNIT I  
**Interference:** Electromagnetic nature of light, Definition and properties of wave front, Huygens Principle, Temporal and Spatial Coherence, Division of amplitude and wave front, Young’s double slit experiment, Lloyd’s single mirror and Fresnel’s Biprism, Interference in Thin Films, Newton’s Rings and Michelson Interferometer. (11 Lectures)

UNIT-II  
**Diffraction and Polarization:** Huygens Principle, Huygens-Fresnel Diffraction theory, Fraunhofer diffraction: Single slit, Circular aperture, Rayleigh criterion of resolution, Resolving Power of a telescope, Double slit, Multiple slits, Diffraction grating; Polarization, Plane polarized light, Representation of Unpolarized and Polarized light, Polarization by Reflection, Brewster’s law, Malus Law, Polarization by Selective absorption by Crystals, Polarization by Scattering, Polarization by Double Refraction. (11 Lectures)

UNIT-III  
**Simple Harmonic Motion:** Simple harmonic motion, Energy of a SHO, Simple, Compound and Torsional pendulum, Electrical Oscillations, damped oscillations, damped harmonic oscillator – heavy, critical, and light damping, Damping coefficients, energy decay in a damped harmonic oscillator, quality factor, forced mechanical oscillators, resonance. (12 Lectures)

UNIT-IV  

**Text and Reference Books:**
**UC-BSHP-125-19**  
**Physics Lab-II**  
**L-0, T-0, P-4**  
**2 Credits**

**Pre-requisites (if any):** High-school education with Physics lab as one of the subject.

**Course Objectives:** The aim and objective of the Physics Lab course is to introduce the students of B. Sc. (Hons.) Physics to the formal structure of wave and vibrations and mechanics so that they can use these as per their requirement.

**Course Outcomes:** At the end of the course, the student will be

<table>
<thead>
<tr>
<th>CO1</th>
<th>Able to understand the theoretical concepts learned in the theory course.</th>
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<tbody>
<tr>
<td>CO2</td>
<td>Trained in carrying out precise measurements and handling equipment.</td>
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<td>CO3</td>
<td>Learn to draw conclusions from data and develop skills in experimental design.</td>
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<td>CO4</td>
<td>Able to understand the principles of error analysis and develop skills in experimental design.</td>
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<tr>
<td>CO5</td>
<td>Able to document a technical report which communicates scientific information in a clear and concise manner.</td>
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</table>

**Mapping of course outcomes with the program outcomes**

<table>
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</table>
Note: Students are expected to perform about 8-10 experiments from the following list, selecting minimum of 6-7 from the Physical Lab and 2-3 from the Virtual lab.

List of experiments:

2. To determine the frequency of an electrically maintained tuning fork in a) Transverse mode of vibration b) Longitudinal mode of vibration.
3. To find out the frequency of AC mains using sonometer.
4. To study the characteristic of Ge-Si junction diode.
5. To analyze the suitability of a given Zener diode as a power regulator.
6. To determine the horizontal and vertical distance between two points using a Sextant.
7. To determine the height of an inaccessible object using a Sextant.
8. To study the Motion of a Spring and calculate (a) Spring Constant (b) Value of \( g \) and (c) Modulus of rigidity.
9. To determine the time period of a simple pendulum for different length and acceleration due to gravity.
10. To study the variation of time period with distance between centre of suspension and centre of gravity for a compound pendulum and to determine: (i) Radius of gyration of the bar about an axis through its C.G. and perpendicular to its length. (ii) The value of \( g \) in the laboratory.
11. To find the moment of inertia of an irregular body about an axis through its C.G with the torsional pendulum.
12. To determine the angular acceleration \( \alpha \), torque \( \tau \), and Moment of Inertia of flywheel.

Reference book and suggested readings:

6. Practical Physics, C L Arora, S. Chand & Company Ltd.

http://www.vlab.co.in
<table>
<thead>
<tr>
<th>UGCA-1909</th>
<th>Object Oriented Programming using C++</th>
<th>L-3, T-1, P-0</th>
<th>4 Credits</th>
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</table>

**Pre-requisite:** NA

**Course Outcomes:** At the end of the course, the student will be able to

- **CO1** To learn programming from real world examples.
- **CO2** To understand Object oriented approach for finding Solutions to various problems with the help of C++ language.
- **CO3** To create computer based solutions to various real-world problems using C++
- **CO4** To learn various concepts of object oriented approach towards problem solving
Course Title: Object Oriented Programming using C++
Course Code: UGCA-1909

UNIT-I

Principles of object oriented programming
Introduction to OOP and its basic features, Basic components of a C++, Program and program structure, Compiling and Executing C++ Program. Difference between Procedure Oriented Language(C) and Object Oriented Language. (12)

UNIT-II

Classes & Objects and Concept of Constructors
Defining classes, Defining member functions, Declaration of objects to class, Access to member variables from objects, Different forms of member functions, Access specifiers (Private, public, protected), Array of objects. Introduction to constructors, Parameterized constructors, Copy Constructor, Multiple constructors in class, Dynamic initialization of objects, Destructors. (10)

UNIT-III

Inheritance and Operator overloading
Introduction to Inheritance, Types of inheritance: - Single inheritance, Multiple inheritance, Multilevel inheritance, Hierarchical inheritance, Hybrid inheritance, Defining operator overloading, Overloading of Unary and Binary operators, Rules for overloading operators. (10)

UNIT-IV

Polymorphism and File Handling
Early Binding, Late Binding, Virtual Functions, pure virtual functions, Abstract Classes. Opening and Closing File, Reading and Writing a file. (10)

Text Books:
<table>
<thead>
<tr>
<th>UGCA-1910</th>
<th>Object Oriented Programming using C++</th>
<th>L-0, T-0, P-4</th>
<th>2 Credits</th>
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<td>To learn programming from real world examples.</td>
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<td>CO2</td>
<td>To understand Object oriented approach for finding Solutions to various problems with the help of C++ language.</td>
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<td>CO3</td>
<td>To create computer based solutions to various real-world problems using C++</td>
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<tr>
<td>CO4</td>
<td>To learn various concepts of object oriented approach towards problem solving</td>
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</tbody>
</table>
Course Title: Object Oriented Programming using C++ Laboratory

Course Code: UGCA-1910

Instructions: Develop all program in C++

Assignments:
1. Write a program to enter mark of 6 different subjects and find out the total mark (Using cin and cout statement)
2. Write a function using reference variables as arguments to swap the values of pair of integers.
3. Write a function to find largest of three numbers.
4. Write a program to find the factorial of a number.
5. Define a class to represent a bank account which includes the following members as Data members:
   a) Name of the depositor b) Account Number c) Withdrawal amount d) Balance amount in the account
   Member Functions:
   a) To assign initial values b)To deposit an amount c) To withdraw an amount after checking the balance d) To display name and balance.
6. Write the above program for handling n number of account holders using array of objects.
7. Write a C++ program to compute area of right angle triangle, equilateral triangle, isosceles triangle using function overloading concept.
8. Consider a publishing company that markets both book and audio cassette version to its works. Create a class Publication that stores the title (a string) and price (type float) of a publication. Derive the following two classes from the above Publication class: Book which adds a page count (int) and Tape which adds a playing time in minutes(float). Each class should have get_data() function to get its data from the user at the keyboard. Write the main() function to test the Book and Tape classes by creating instances of them asking the user to fill in data with get_data() and then displaying it using put_data().
9. Consider an example of declaring the examination result. Design three classes student, exam and result. The student has data members such as rollno, name. Create the class exam by inheriting the student class. The exam class adds data members representing the marks scored in 5 subjects. Derive the result from exam-class and it has own data members like total, avg.
10. Write a program for overloading of Unary ++ operator.
11. Write a program for overloading of Binary + operator.
12. Write a program of Virtual Functions.
13. Write a program of Abstract Classes.

14. Write a program to read and write from file.

**Reference Books:**
Introduction to Organic Chemistry

Pre-requisite: Knowledge of basic concepts in Mathematics, such as graphs, functions, conics, matrices etc.

Course Objectives:
1. To teach the basic principles, reaction mechanisms and stereochemistry of organic compounds.
2. To impart knowledge regarding physical properties and chemical reactions of alkanes, alkenes, dienes, alkynes, arenes, alkyl and aryl halides etc.
3. To predict and account for the most commonly encountered reaction mechanisms (substitution, addition and elimination) in organic chemistry.
4. To teach the basic principles, reaction mechanisms and stereochemistry of organic compounds.
5. To impart knowledge regarding physical properties and chemical reactions of alkanes, alkenes, dienes, alkynes, arenes, alkyl and aryl halides etc.
6. To predict and account for the most commonly encountered reaction mechanisms (substitution, addition and elimination) in organic chemistry

Course Outcomes: At the end of the course, the students will be able to

CO1 Understand the fundamental concepts of organic chemistry i.e structure, bonding and various effects in organic compounds.

CO2 To learn the stereochemistry viz. optical isomerism, stereoisomerism and conformational isomerism of organic compounds.

CO3 To study the various known reactive intermediate in organic synthesis

CO4 To learn the fundamental and advanced concepts of reaction mechanisms along with the study of reaction mechanisms in various types of substitution addition and elimination reactions.

CO5 To predict the relationships between organic chemical structures and their reactivity.

Mapping of course outcomes with the program outcomes

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</table>
Course Title: Introduction to Organic Chemistry  
Course Code: UC-BHCL-113-19

Unit-I

Basics of Organic Chemistry Organic Compounds:
Classification, and Nomenclature, Hybridization, Shapes of molecules, Influence of hybridization on bond properties. Electronic Displacements: Inductive, electromeric, resonance and mesomeric effects, hyper conjugation and their applications; Dipole moment; Organic acids and bases; their relative strength. Homolytic and Heterolytic fission with suitable examples. Curly arrow rules, formal charges; Electrophiles and Nucleophiles; Nucleophilicity and basicity; Types, shape and their relative stability of Carbocations, Carbanions, Free radicals and Carbenes.  

Unit-II

Introduction to types of organic reactions: -

Unit-III

Chemistry of Aliphatic Hydrocarbons

B. Carbon-Carbon \( p \) bonds: Formation of alkenes and alkynes by elimination reactions, Mechanism of E1, E2, E1cb reactions. Saytzeff and Hofmann eliminations. Reactions of alkenes: Electrophilic additions their mechanisms (Markownikoff/ Anti Markownikoff addition), mechanism of oxymercuration-demercuration, hydroborationoxidation, ozonolysis, reduction (catalytic and chemical), syn and anti-hydroxylation (oxidation). 1,2-and 1,4-addition reactions in conjugated dienes and, Diels-Alder reaction.  

Unit-IV

Aromatic Hydrocarbons Aromaticity:
Hückel’s rule, aromatic character of arenes, cyclic carbocations/carbanions and heterocyclic compounds with suitable examples. Electrophilic aromatic substitution: halogenation, nitration, sulphonation and Friedel-Craft’s alklyation/aclylation with their mechanism. Directing effects of the groups.
REFERENCE BOOKS:


2. Finar, I. L. Organic Chemistry (Volume 1), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education)


Introduction to Organic Chemistry Lab

L-0, T-0, P-4  2 Credits

Pre-requisite: Knowledge of basic concepts in Mathematics, such as, graphs, functions, conics, matrices etc.

Course Objectives:
The objective of this course is to provide practical knowledge and illustrative experiments regarding qualitative analysis, isolation, and purification of organic compounds

Course Outcomes: At the end of the course, the students will be able to

<table>
<thead>
<tr>
<th>CO1</th>
<th>To check the purity of organic compounds by determining the melting or boiling points.</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO2</td>
<td>To develop preparative skills for purification of organic compounds by crystallization method.</td>
</tr>
<tr>
<td>CO3</td>
<td>To determine the element or functional groups present in organic compound by organic qualitative analysis.</td>
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<tr>
<td>CO4</td>
<td>To present their work with practical skills and the awareness of health and safety procedures.</td>
</tr>
<tr>
<td>CO5</td>
<td>To apply related experiments for their research work.</td>
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</table>

Mapping of course outcomes with the program outcomes

<table>
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<th>PSO1</th>
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</table>
Course Title: Introduction to Organic Chemistry Lab  
Course Code: UC-BHCP-119-19

Unit-I

**Determination of melting point**
Napthalene 80-82°, Benzoic acid 121.5-122°, Urea 132.5-133°, Succinic acid 184.5-185°, Cinnamic acid 132.5-133°, Salicylic acid 157.5-158°, Acetanilide 113.5-114°, m-Dinitrobenzene 90°, p-Dichlorobenzene 52°, Aspirin 135°

**Determination of boiling point**
Ethanol 78°, Cyclohexane 81.4°, Toluene 110.6°, Benzene 80°

Unit-II

**Distillation**
Simple distillation of ethanol-water mixture using water condenser
Distillation of nitrobenzene and aniline using air condenser

**Crystallization**
Concept of induction of crystallization
Phthalic acid from hot water (using fluted filter paper and stemless funnel)
Acetanilide from boiling water
Napthalene from ethanol
Benzoic acid from water

Unit-III

**Qualitative Analysis**

**Elemental analysis**
nitrogen, sulphur, chlorine, bromine, iodine

**Functional groups**
- phenols, carboxylic acids

Unit-IV

- carbonyl compounds - ketones, aldehydes
- carbohydrates
- aromatic amines
- amides, ureas and anilides
- aromatic hydrocarbons and their halo- derivatives

Reference Books


BBA-GE 201-18 | Managerial Economics II | L-5, T-1, P-0 | 6 Credits

**Pre-requisite:** Understanding of basic knowledge of Managerial Economics

**Course Objectives:** This course aims to acquaint students with economy as a whole including measurement of national income, inflation and unemployment, which an objective to inculcate understanding of macroeconomic environment of an economy for better decision making.

**Course Outcomes:** After completion of the course, the students shall be able to:

- **CO1** Explain the concept of national income and its measurement using different approaches.
- **CO2** Describe the underlying theories of demand and supply of money in an economy.
- **CO3** Make use of employment and national income statistics students will be able to describe and analyze the economy in quantitative terms.
- **CO4** Interpret macroeconomic issues like money, inflation and unemployment.
- **CO5** Identify the phases of the business cycle and the problems caused by cyclical fluctuations in the market economy

**Mapping of course outcomes with the program outcomes**

<table>
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<th>Program Outcome</th>
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</table>
Course Title: Managerial Economics II
Course Code: BBAGE 201-18

UNIT-I

UNIT-II
Theories of Inflation and Unemployment: Meaning, Types and Theories of Inflation. - Cost of inflation and sacrifice ratio. - Measurement of Inflation in India - Policies to control inflation Meaning and types of unemployment. - Cost of unemployment and Oakun’s Law Measurement of unemployment in India. - Concept of Stagflation - Concept of Philips Curve.

Unit-III

Unit-IV

RECOMMENDED BOOKS:
Communicative English - II

UC-BHHL-115-19

L-2, T-0, P-0

Pre-requisite: Basic proficiency in Communication Skills

Course Objectives: The main objective of this course is:
- To help the students become proficient in LSRW-Listening, Speaking, Reading & Writing skills
- To help the students become the independent users of English language
- To develop in them vital communication skills, integral to their personal, social and professional interactions
- To teach them the appropriate language of professional communication
- To prepare them for job market

Course Outcomes: At the end of the course, the student will

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<th>Course Outcome (CO)</th>
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<td>CO1</td>
<td>acquire basic proficiency in reading &amp; listening, writing and speaking skills</td>
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<tr>
<td>CO2</td>
<td>be able to understand spoken and written English language, particularly the language of their chosen technical field.</td>
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<tr>
<td>CO3</td>
<td>be able to converse fluently.</td>
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<tr>
<td>CO4</td>
<td>be able to produce on their own clear and coherent texts.</td>
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<tr>
<td>CO5</td>
<td>become proficient in professional communication, such as, interviews, group discussions, office environments, important reading skills as well as writing skills and thereby will have better job prospects.</td>
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</table>

Mapping of course outcomes with the program outcomes:

<table>
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<th>Course Outcome (CO)</th>
<th>PSO1</th>
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</table>
Course Title: Communicative English-II  
Course Code: BHHL115-19

UNIT-I  
(Literature)

The following poems from this anthology are prescribed:  
4. The Soul’s Prayer: Sarojini Naidu  
5. I Sit and Look Out: Walt Whitman  
6. Women's Rights: Annie Louise Walker

(D) *Prose Parables* (Orient Black Swan, 2013)  
The following stories from the above volume are prescribed:  
a. The Doctor's Word: R.K. Narayan  
b. The Doll's House: Katherine Mansfield  
c. Dusk: H.H. Munroe (Saki)  
d. 

UNIT-II

Vocabulary:  
Standard abbreviations; One word substitution; Word Pairs (Homophones/Homonyms)  
Grammar: Sentence Structures; Use of phrases and clauses in sentences; Transformation of Sentences; Importance of proper punctuation

UNIT-III

Reading and Understanding:  
Summary Paraphrasing; Analysis and Interpretation; Translation (from Hindi/Punjabi to English and vice-versa)  
Close Reading; Comprehension;

UNIT-IV

Mechanics of Writing & Speaking Skills:  
Report writing; Career Documents- Job applications, Resume/CV writing, Common Everyday Situations: Conversations & Dialogues, Formal Presentations

REFERENCE BOOKS  
<table>
<thead>
<tr>
<th>UC-BHHL-116A</th>
<th>PUNJABI COMPULSORY-II (ਪੰਜਾਬੀ ਲਾਜ਼ਮੀ-II)</th>
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<td>Course Objectives</td>
<td>1. To enhance the language ability of students.</td>
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<td>2. To enhance the ability of Learning science and developing science literacy through local language teaching with science subjects.</td>
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<tr>
<td>Course Outcomes:</td>
<td>At the end of the course, the student will be able to</td>
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<tr>
<td>CO1.</td>
<td>Translate and transfer/broadcast the western scientific knowledge in the local language.</td>
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<tr>
<td>CO2.</td>
<td>Translate and transfer the indigenous/traditional scientific knowledge available in local knowledge into English and other global languages.</td>
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<td>CO3.</td>
<td>Understand the society through Punjabi language, literature and culture.</td>
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<td>CO4.</td>
<td>Learning science and in developing science literacy.</td>
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<tr>
<td>CO5.</td>
<td>Improve the internal communication.</td>
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Course Title: PUNJABI COMPULSORY-II (ਪੰਜਾਬੀ ਲਾਜ਼ਮੀ-II)
Course Code: BHHL116A-19

UNIT-I

德拉ਤਿਤਵ ਸੀਮਾ:
ਅਧਿਕਾਰੀਪਦ, ਦੇਵ ਕੁਲਾਰ ਕੁਲਾਰ ਦੀ ਸਮਾਜ
ਤਸਦੀਕ ਸਮਲਣਾ ਦਾ ਦਿਨ:
ਚੌਂਗੀ ਦੀ ਚੈਟ, ਪਹਾੜੀ ਭਾਸ਼ਾ ਪ੍ਰਤੀ ਧਾਰਾਖ਼ਸ਼ਾ, ਖੇਤ
ਪ੍ਰਦਾਣ:
ਦਿਹਕਦੇ ਅੰਗਾਰੀਆਂ ‘ਤੇ ਦੁਨੀਆਂ ਭਾਗ:
ਇੰਕਾਰ ਦੁਆਰਾ ‘ਤੇ ਭਾਗ, ਦੁਆਰਾ ਦਾਤਾਂ ‘ਤੇ।

UNIT-II

ਸਦੀਵੀ ਕਥਾ:
ਸੰਧਾਨ ਸੂਚਿ ਪੀਛੀ,
ਭਾਰਤੀ ਸਹਿਮਤੀ,
ਚੁਣਾ ਗਤਾ,
ਕੋਈ ਇਕ ਸਵਾਰ
ਪੰਤੀ ਪੰਤ ਕਾਸ਼,
ਲੰਛਤੀ ਮੋਹਨ ਬੰਦਰੀ,
ਘੋਟਣਾ
ਵਿਰਆਦ ਸੰਧੂ,
ਆਪਣਾ ਆਪਣਾ ਹੱਸਾ (8)

UNIT-III

ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਦੀਆਂ ਸੌਚਸ਼ਤਾਵਾਂ,
ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਉੱਪਰ ਪਰਾਭਾਸ (6)

UNIT-IV

ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਦੀਆਂ ਸੌਚਸ਼ਤਾਵਾਂ,
ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਉੱਪਰ ਪਰਾਭਾਸ (8)

Reference Books

ਸੰਪਨਵਾਦੀ ਸਿੰਘ, ਸਾਹਿਤ ਦੇ ਰੰਗ, ਮਰਿਆਦ ਪੰਤ ਕਾਸ਼, ਅਕਸਸ਼ਰ, 2016.
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<th>UC-BHHL-116B</th>
<th>MUDHLI PUNJABI-II (ਮੁਢਲੀ ਪੰਜਾਬੀ-II)</th>
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<tr>
<td><strong>Pre-requisite:</strong></td>
<td>ਮੁਢਲੀ ਪੰਜਾਬੀ (Mudhli Punjabi)-I</td>
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| **Course Objectives** | 1. To enhance the language ability of students.  
2. To enhance the ability of Learning science and developing science literacy through local language teaching with science subjects. |             |           |
| **Course Outcomes:** | At the end of the course, the student will be able to |             |           |
| CO1. | Translate and transfer/broadcast the western scientific knowledge in the local language. |             |           |
| CO2. | Translate and transfer the indigenous/traditional scientific knowledge available in local knowledge into English and other global languages. |             |           |
| CO3. | Understand the society through Punjabi language, literature and culture. |             |           |
| CO4. | Learning science and in developing science literacy. |             |           |
| CO5. | Improve the internal communication. |             |           |

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<tr>
<th>CO1</th>
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<th>CO3</th>
<th>CO4</th>
<th>CO5</th>
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Course Title: MUDHLI PUNJABI-II (ਮੁਢਲੀ ਪੰਜਾਬੀ-II)
Course Code: BHHL116B-19

UNIT-I
ਸ਼ਬਦ ਸ ਤਾਨੇਖਾਂ: ਪਛਾਣ ਤੇ ਵਰਤਿਨਾਵ,
ਪੜਨਾਵ ਵਿਸ਼ੇਸ਼ਣ,
ਕਿਰਾਈ ਵਿਸ਼ੇਸ਼ਣ
(8)

UNIT-II
ਰੋਜ਼ਾਨਾ ਵਰਤਿ ਦੀ ਪੰਜਾਬੀ ਸ ਤਬਦਲੀ:
ਬਾਜ਼ਾਰ, ਕਿਰਾਈ, ਜਿਸਵੇਂ ਤੇ ਵਿਦਰੀਆਂ ਮਾਫਂਦੀ
(8)

UNIT-III
ਪੰਜਾਬੀ ਵਾਕ ਬਣਤਰ:
ਸਧਾਰਨ ਵਾਕ
ਸੰਯੁਕਤ ਵਾਕ
ਿਮਸ਼ਰਤ ਵਾਕ
(8)

UNIT-IV
ਸਧਾਰਨ ਵਾਕਾਂ ਦਾ ਅੰਗਰੇਜ਼ੀ ਤੱਕ ਪੰਜਾਬੀ ਅਨੁਵਾਦ
ਸਧਾਰਨ ਵਾਕਾਂ ਦਾ ਪੰਜਾਬੀ ਤੱਕ ਅੰਗਰੇਜ਼ੀ ਅਨੁਵਾਦ
(8)

Reference Books
1. ਸੁਖਿਵੰਦਰ ਿਸੰਘਾ, ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਿਵਿਗਆਨ, ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਅਕਾਦਮੀ ਜਲੰਧਰ