B. Sc. (Honors) Mathematics

Choice Based Credit System (CBCS) and Outcome Based Education (OBE)

SEMESTER - VII

Complex Analysis			
Course Code	**21BSM71**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	2:2:0:0	SEE	50
Total Hours of Pedagogy	40	Total	100
Credits	3	Exam Hours	3hrs

Course Learning objectives:

The course will enable students to:

1. Provide insight into application of Complex variable, arising in potential theory, quantum mechanics, heat conduction and field theory.
2. Complex Analysis aims to provide basic concepts of Complex plane and function, Analytic function and Cauchy-Riemann Equation, Cauchy's Theorem and Fundamental Theorem of Algebra, Power Series, Singularities and Contour Integration.

Teaching-Learning Process (General Instructions)

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

1. In addition to the traditional lecture method, different types of innovative teaching methods may be adopted so that the delivered lessons shall develop student's theoretical and applied mathematical skills.
2. State the need for Mathematics with Engineering Studies and Provide real-life examples.
3. Support and guide the students for self-study.
4. You will also be responsible for assigning homework, grading assignments and quizzes, and documenting students' progress.
5. Encourage the students for group learning to improve their creative and analytical skills.
6. Show short related video lectures in the following ways:
    - As an introduction to new topics (pre-lecture activity).
    - As a revision of topics (post-lecture activity).
    - As additional examples (post-lecture activity).
    - As an additional material of challenging topics (pre-and post-lecture activity).
    - As a model solution of some exercises (post-lecture activity).

Module-1: Complex Plane and Functions

Complex numbers and their representation, algebra of complex numbers; Complex plane, Open set, Domain and region in complex plane; Stereographic projection and Riemann sphere; Complex functions and their limits including limit at infinity; Continuity. **(8 hours)**

Self-study: Linear fractional transformations and their geometrical properties.

(RBT Levels: L1, L2 and L3)

Pedagogy	Chalk and talk method/PowerPoint Presentation.

Module-2: Analytic Functions and Cauchy-Riemann Equations:

Differentiability of a complex valued function, Cauchy-Riemann equations, Harmonic functions, necessary and sufficient conditions for differentiability, Analytic functions; Analyticity and zeros of exponential, trigonometric and logarithmic functions. **(8 hours)**

Self-study: Branch cut and branch of multi-valued functions.

RBT Levels: L1, L2 and L3

Pedagogy	Chalk and talk method/PowerPoint Presentation.

Module-3: Cauchy Theorems and Fundamental Theorem of Algebra

Line integral, Path independence, Complex integration, Green's theorem, Anti-derivative theorem, Cauchy-Goursat theorem, Cauchy integral formula, Cauchy's inequality, Derivative of analytic function, Liouville's theorem, Fundamental theorem of algebra. **(8 hours)**

Self-study: Maximum modulus theorem and its consequences.	
RBT Levels: L1, L2 and L3	
Pedagogy	Chalk and talk method/Power Point Presentation.
Module-4: Power Series	
Sequences, series and their convergence, Taylor series and Laurent series of analytic functions, Power series, Radius of convergence, Integration and differentiation of power series. **(8 hours)** **Self-study:** Absolute and uniform convergence of power series.	
RBT Levels: L1, L2 and L3	
Pedagogy	Chalk and talk method/PowerPoint Presentation.
Module-5: Singularities and Contour Integration	
Meromorphic functions, Zeros and poles of meromorphic functions, Nature of singularities, Picard's theorem, Residues, Cauchy's residue theorem, Argument principle, Jordan's lemma, Evaluation of proper and improper integrals. **(8 hours)** **Self-study:** Rouche's theorem.	
RBT Levels: L1, L2 and L3)	
Pedagogy	Chalk and talk method/PowerPoint Presentation.

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

- Visualize complex numbers as points of $R^2$and stereographic projection of complex plane on the Riemann sphere.
- Understand the significance of differentiability and analyticity of complex functions leading to the Cauchy-Riemann equations.
- Learn the role of Cauchy-Goursat theorem and Cauchy integral formula in evaluation of contour integrals.
- Apply Liouville's theorem in fundamental theorem of algebra.
- Understand the convergence, term by term integration and differentiation of a power series.
- Learn Taylor and Laurent series expansions of analytic functions, classify the nature of singularity, poles and residues and application of Cauchy Residue theorem.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE).

Continuous Internal Evaluation:

Three Unit Tests each of **20 Marks (duration 01 hour**)

1. First test at the end of 5th week of the semester
2. Second test at the end of the 10th week of the semester
3. Third test at the end of the 15th week of the semester

Two assignments each of **10 Marks**

4. First assignment at the end of 4th week of the semester
5. Second assignment at the end of 9th week of the semester

Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for **20 Marks** (**duration 01 hours**)

6. At the end of the 13th week of the semester

The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be **scaled down to 50 marks**

(to have less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course).

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 03 hours)**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.

Books Recommended:

1. Lars V. Ahlfors (2017). Complex Analysis (3rd edition). McGraw-Hill Education.
2. Joseph Bak & Donald J. Newman (2010). Complex Analysis (3rd edition). Springer.
3. James Ward Brown & Ruel V. Churchill (2009). Complex Variables and Applications (9th edition). McGraw-Hill Education.
4. John B. Conway (1973). Functions of One Complex Variable. Springer-Verlag.
5. E.T. Copson (1970). Introduction to Theory of Functions of Complex Variable. Oxford University Press.
6. Theodore W. Gamelin (2001). Complex Analysis. Springer-Verlag.
7. George Polya & Gordon Latta (1974). Complex Variables. Wiley.
8. H. A. Priestley (2003). Introduction to Complex Analysis. Oxford University Press.
9. E. C. Titchmarsh (1976). Theory of Functions (2nd edition). Oxford University Press.
10. S Shanthinarayan(2012). Complex Analysis. S Chand Co. Pvt. Ltd.
11. A R Vasista(2012). Complex Analysis. Krishna Prakashana Mandira.

Web links and Video Lectures (e-Resources):

- http://.ac.in/courses.php?disciplineID=111
- http://www.class-central.com/subject/math(MOOCs)
- http://academicearth.org/
- VTU EDUSAT PROGRAMME-20

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Quiz
- Group assignment
- Seminars

B. Sc. Honors (Mathematics)
Choice Based Credit System (CBCS) and Outcome-Based Education (OBE)
SEMESTER – VII

Advanced Linear Algebra

Course Code	21BSM72	CIE Marks	50
Teaching Hours/Week (L: T:P:S)	2:2:0:0	SEE Marks	50
Total Number of Contact Hours	40	Total Marks	100
Credits	03	Exam Hours	3

Course Learning Objectives: This course will enable students to:

1. To familiarize the important tools of linear algebra, that are essential in all branches of Science.
2. To develop the knowledge/skills of linear transformation and decomposition techniques in a comprehensive manner.

Teaching-Learning Process (General Instructions):

These are sample Strategies: which teachers can use to accelerate the attainment of the various course outcomes.

1. In addition to the traditional lecture method, different types of innovative teaching methods may be adopted so that the delivered lessons shall develop students' theoretical and applied mathematical skills.
2. State the need for Mathematics with Engineering Studies and Provide real-life examples.
3. Support and guide the students for self–study.
4. You will also be responsible for assigning homework, grading assignments and quizzes, and documenting students' progress.
5. Encourage the students for group learning to improve their creative and analytical skills.
6. Show short related video lectures in the following ways:
   - As an introduction to new topics (pre-lecture activity).
   - As a revision of topics (post-lecture activity).
   - As additional examples (post-lecture activity).
   - As an additional material of challenging topics (pre-and post-lecture activity).
   - As a model solution for some exercises (post-lecture activity).

Module – 1: Linear System of Equations

Consistent and inconsistent systems and its solution sets; LU-decomposition. Vector Spaces: Vector spaces; subspaces; Linearly independent and dependent vectors; Bases and dimension; coordinate vectors; computations concerning subspaces-Illustrative examples. **(8 Hours)**

Self-study: Basics of vectors.

(RBT Levels: L1, L2 and L3)

Pedagogy	Chalk and Board, Problem-based learning

Module – 2: Linear Transformations

Linear transformations; algebra of transformations; representation of transformations by matrices; linear functional; Non-singular Linear transformations; inverse of a linear transformation. Rank-Nullity theorem. **(8 Hours)**

Self-study: Problems on Rank-Nullity theorem.

(RBT Levels: L1, L2 and L3)	
Pedagogy	Chalk and Board, Problem based learning

Module – 3: Inner Product Spaces

Inner products; inner product spaces; orthogonal sets and orthogonal projections; Gram-Schmidt orthogonalization process; QR-decomposition. **(8 Hours)**
Self-study: Least square method.
(RBT Levels: L1, L2 and L3)

Pedagogy	Chalk and Board, Problem-based learning

Module – 4: Introduction to Spectral Theory

Eigenvalues and eigenvectors; Diagonalization; quadratic Forms, constrained optimization; Singular value decomposition. **(8 Hours)**
Self-study:
(RBT Levels: L1, L2 and L3)

Pedagogy	Chalk and Board, Problem-based learning

Module–5: Adjoint of a Linear Transformation and Canonical Forms

Adjoint of a linear operator; Hermitian, unitary and normal linear transformations; Jordan canonical form, Triangular form, Trace and transpose, Invariant subspaces. **(8 Hours)**
(RBT Levels: L1, L2 and L3)

Pedagogy	Chalk and Board, Problem-based learning

Course Outcomes

- Analyze whether a system is consistent or inconsistent, its solution is unique or infinite and find bases and dimension of vector spaces required in network analysis.
- Linearly transform the system from one dimension to another in matrix form, required to analyze image processing problems.
- Compute orthogonal and orthonormal basis vectors required to analyze image and signal processing problems.
- Apply techniques of constrained optimization and singular value decomposition for problems arising in control system analysis, signals and systems.
- Apply linear algebraic tools to analyze problems in graphs and networks problems, computer graphics.

Assessment Details (both CIE and SEE)
The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE).
Continuous Internal Evaluation:
Three Unit Tests each of **20 Marks (duration 01 hour**)
1. First test at the end of 5th week of the semester
2. Second test at the end of the 10th week of the semester
3. Third test at the end of the 15th week of the semester
Two assignments each of **10 Marks**
4. First assignment at the end of 4th week of the semester
5. Second assignment at the end of 9th week of the semester
Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for **20 Marks** (**duration 01 hour**)
6. At the end of the 13th week of the semester

The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be **scaled down to 50 marks**
(to have less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course).
CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.
Semester End Examination:
Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 03 hours)**
1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.

Books recommended:

1. David C. Lay, "Linear Algebra and its Applications", Cambridge University Press 3rd Edition, 2017.
2. Gilbert Strang, "Introduction to Linear Algebra", Wellesley-Cambridge Press 5th Edition, 2016.
3. Stephen H Friedberg, Arnold J. Insel & Lawrence E. Spence (2003). Linear Algebra (4th edition). Prentice-Hall of India Pvt. Ltd.
4. Bernard Kolman and David R. Hill, "Introductory Linear Algebra with Applications", Pearson Education (Asia) Pvt. Ltd 7th Edition, 2003.
5. Kenneth Hoffman and Ray Kunze, "Linear Algebra", Pearson Education (Asia) Pvt. Ltd, 2004. 2nd Edition, 2004
6. Howard Anton and Chris Rorres, "Elementary Linear Algebra with Applications" Version Wiley, 2014 11th Edition, 2014.
7. Gareth Williams, "Linear Algebra with applications", Jones Bartlett Publishers Inc., 6th Ed., 2017.

Web links and Video Lectures (e-Resources):

http://www.class-central.com/subject/math(MOOCs)

http://academicearth.org/

http://www.bookstreet.in.

VTU EDUSAT PROGRAMME – 20

VTU e-Shikshana Program

Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning

- Quizzes
- Assignments
- Seminars

B. Sc. Honors (Mathematics)

Choice Based Credit System (CBCS) and Outcome Based Education (OBE)

SEMESTER - VII

Advanced Linear Algebra Lab			
Course Code	21BMATL73	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	1:0:2:0	SEE Marks	50
Credits	02	Exam Hours	3 Hours

Course Description: This course will enable the students to gain hands-on experience in Mathematical tools to executive the practical problems (Maxima/ Scilab/MatLab/Mathematica/ Python).

Course Learning Objectives: This course will help the learner to

- Solve the system of equations and find the inverse of a matrix.
- Understand and verify the linear combination, independence & orthogonality of vectors
- Understand the Gram-Schmidt orthogonalization & QR decomposition process.
- Develop the skill of SVD of non-square matrices
- Represent the given matrix as quadratic forms and its constrained optimization.

List of Experiments:

Any Ten Experiments to be performed

Sl.NO	**Experiments**
1	Programs to solve the system of equations
2	Programs to find the inverse of square matrices
3	Programs to express a vector in terms of a linear combination of a given set of vectors
4	Programs to verify the linear independence of vectors
5	Programs to verify whether the given transformation is linear.
6	Programs for finding a matrix of linear transformation
7	Programs on orthogonality of vectors
8	Programs on the Gram-Schmidt orthogonalization process
9	Programs on the QR decomposition process
10	Programs on SVD of a matrix
11	Programs on constrained optimization to detect extreme values of quadratic forms
12	Programs to find trace and transpose of a linear operator

Course outcomes (Course Skill Set):

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

1. Solve the system of equations and find the inverse of a matrix.
2. Verify the linear combination, independence & orthogonality properties of given vectors
3. Apply the Gram-Schmidt orthogonalization for a set of vectors
4. Apply the QR decomposition process for a given matrix.

5. Develop the SVD of non-square matrices
6. Compute the extreme values of quadratic forms

Assessment Details (both CIE and SEE)

Continuous Internal Evaluation (CIE): The CIE marks awarded in the case of Practical shall be based on the weekly evaluation of laboratory journals/ reports after the conduction of every experiment and one practical test.

Semester End Evaluation (SEE): The practical examinations to be conducted as per the time table of University in a batch wise with strength of students not more than 10-15 per batch.

1. All laboratory experiments are to be included for practical examination.
2. Breakup of marks and the instructions printed on the cover page of answer script to be strictly adhered by the examiners.
3. Students can pick one experiment from the questions lot prepared by the examiners.
4. Change of experiment is allowed only once and 15% Marks allotted to the procedure part to be made zero.

Books:

1. David C. Lay, "Linear Algebra and its Applications", Cambridge University Press 3rd Edition, 2017.
2. Gilbert Strang, "Introduction to Linear Algebra", Wellesley-Cambridge Press 5th Edition, 2016.
3. Gareth Williams, "Linear Algebra with applications", Jones Bartlett Publishers Inc., 6th Ed., 2017.

Suggested Learning Resources:

http://vlabs.iitb.ac.in
http://math.fulletron.edu/mathews/numerical.html
http://www.my-mooc.com/en/categorie/mathematics
www.python.org

B. Sc. Honors (Mathematics)

Choice Based Credit System (CBCS) and Outcome Based Education (OBE)

SEMESTER - VII

Discrete Mathematical Structures			
Course Code	**21BSM741**	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	2:2:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03

Course objectives: This course will enable the students to:

1. Understand the Basic concept Logic and Counting principles
2. Understand the relations and its representations
3. Familiarize the concept of Boolean algebra and Boolean functions, logic gates, switching circuits and their applications.
4. Apply the discrete mathematical structures in real-life problems using finite-state and Turing machines.

Pedagogy **(General Instructions):**

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

1. In addition to the traditional lecture method, different types of innovative teaching methods may be adopted so that the delivered lessons shall develop students' theoretical and applied mathematical skills.
2. State the need for Mathematics Science Studies and Provide real-life examples.
3. Support and guide the students for self–study.
4. You will also be responsible for assigning homework, grading assignments and quizzes, and documenting students' progress.
5. Encourage the students for group learning to improve their creative and analytical skills.
6. Show short related video lectures in the following ways
   - As an introduction to new topics (pre-lecture activity).
   - As a revision of topics (post-lecture activity).
   - As additional examples (post-lecture activity).
   - As an additional material of challenging topics (pre-and post-lecture activity).
   - As a model solution of some exercises (post-lecture activity).

Module-1: Logic & Counting Principles

Introduction to logic, Rules of Inference (for quantified statements), Validity of Arguments. Methods of proof: Direct, Indirect proofs, Proof by contradiction, Proof by cases etc.

The product rule, The sum rule, The inclusion–exclusion principle, The Pigeonhole Principle and examples. Simple arrangements and selections. Arrangements and selections with repetitions. **(8 Hours)**

Self-study: Normal forms, Binomial Coefficients.

(RBT Levels: L1, L2 and L3)

Teaching-Learning Process	Chalk and talk method / Power Point Presentation

Module-2: Relations

Definition and types of relations. Representing relations using matrices and digraphs, Closures of relations, Paths in digraphs, Transitive closures, Warshall's Algorithm. Order relations, Posets, Order isomorphism, Hasse diagrams. Dual of a poset, Duality principle, Maximal and minimal elements, Least upper bound and Greatest lower bound, Building new posets, Maps between posets. **(8 Hours)**

Self-study: Equivalence classes.

(RBT Levels: L1, L2 and L3)

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-3: Lattices

Lattices as posets, Lattices as algebraic structures, Sublattices, Products and homomorphisms; Definitions, examples and properties of modular and distributive lattices; Complemented, relatively complemented.
Self-Study: Sectionally complemented lattices. **(8 Hours)**

(RBT Levels: L1, L2 and L3)

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-4: Boolean Algebras and Switching Circuits

Boolean algebras, De Morgan's laws, Boolean homomorphism, Representation theorem; Boolean polynomials, Boolean polynomial functions, Disjunctive and conjunctive normal forms, Minimal forms of Boolean polynomials, Quine–McCluskey method, Switching circuits and applications. **(8 Hours)**
Self-Study: Karnaugh diagrams.

(RBT Levels: L1, L2 and L3)

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-5: Finite-State and Turing Machines

Finite-state machines with outputs, and with no output; Deterministic and nondeterministic finite-state automaton; Turing machines: Definition, examples, and computations. **(8 Hours)**

(RBT Levels: L1, L2 and L3)

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Course outcomes: After successfully completion of the course, the students will be able:

- Learn about logic and counting techniques.
- Learn about relations, partially ordered sets, lattices and their types.
- Understand Boolean algebra and Boolean functions, logic gates, switching circuits and their applications.
- Solve real-life problems using finite-state and Turing machines.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE).

Continuous Internal Evaluation:

Three Unit Tests each of **20 Marks (duration 01 hour**)
1. First test at the end of 5th week of the semester
2. Second test at the end of the 10th week of the semester
3. Third test at the end of the 15th week of the semester

Two assignments each of **10 Marks**
4. First assignment at the end of 4th week of the semester
5. Second assignment at the end of 9th week of the semester

Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for **20 Marks** (**duration 01 hours**)
6. At the end of the 13th week of the semester

The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be **scaled down to 50 marks**
(to have less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course).

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 03 hours)**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.

Text/Reference Books:

1. B. A. Davey & H. A. Priestley (2002). Introduction to Lattices and Order (2nd edition). Cambridge University Press.
2. Edgar G. Goodaire & Michael M. Parmenter (2018). Discrete Mathematics with Graph Theory (3rd edition). Pearson Education.
3. Rudolf Lidl & Günter Pilz (1998). Applied Abstract Algebra (2nd edition). Springer.
4. Kenneth H. Rosen (2012). Discrete Mathematics and its Applications: With Combinatorics and Graph Theory (7th edition). McGraw-Hill.
5. C. L. Liu (1985). Elements of Discrete Mathematics (2nd edition). McGraw-Hill.
6. Ralph P Grimaldi(2006). Disc Discrete and Combinatorial Mathematics. Pearson Education. 5th Edition.

Web links and Video Lectures (e-Resources):

- **http://www.themathpage.com/**
- **http://www.abstractmath.org/**
- **http://www.ocw.mit.edu/courses/mathematics/**

Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning

- Quiz
- Group assignment and
- Seminars

B. Sc. Honors (Mathematics)

Choice Based Credit System (CBCS) and Outcome Based Education (OBE)

SEMESTER - VII

Fluid Mechanics			
Course Code	**21BSM742**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	2:2:0:0	SEE	50
Total Hours of Pedagogy	40	Total	100
Credits	3	Exam Hours	3hrs

Course Learning objectives: The course will enable students to:

1. Familiarize the students with basic concepts of fluid dynamics.
2. Develop the problem-solving skills essential to fluid dynamics in practical applications.
3. Understand the fundamental knowledge of fluids and its properties.
4. Learn the basic concepts of boundary layer theory and its applications.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. In addition to the traditional lecture method, different types of innovative teaching methods may be adopted so that the delivered lessons shall develop student's theoretical and applied mathematical skills.
2. State the need for Mathematics with Engineering Studies and Provide real-life examples.
3. Support and guide the students for self-study.
4. You will also be responsible for assigning homework, grading assignments and quizzes, and documenting students' progress.
5. Encourage the students for group learning to improve their creative and analytical skills.
6. Show short related video lectures in the following ways:
   - As an introduction to new topics (pre-lecture activity).
   - As a revision of topics (post-lecture activity).
   - As additional examples (post-lecture activity).
   - As an additional material of challenging topics (pre-and post-lecture activity).
   - As a model solution of some exercises (post-lecture activity).

Module-1: Introduction and Preliminaries

Definitions of fluid dynamics and fluid statics, Properties of Fluids, classification of fluids, viscosity, kinematic viscosity, Newton law of viscosity, Newtonian and non-Newtonian fluid, rotational and irrotational flows, Motion of Inviscid Fluids: Pressure at a point in a fluid at rest and that in motion, Euler's equation on motion, Barotropic flows, illustrative examples thereon. **(8 Hours)**

Self-study: Bernoulli's equations in standard forms.

(RBT Levels: L1, L2 and L3)

Pedagogy	Chalk and talk method/PowerPoint Presentation.

Module-2: Two Dimensional Flows of Inviscid Fluids

Meaning of two-dimensional flows and examples, Stream function, Complex potential, Line Sources and Line Sinks, Line Doublets and Line Vortices, Milne Thomson circle theorem and Applications. **(8 Hours)**

Self-study: Blasius theorem.

(RBT Levels: L1, L2 and L3)

Pedagogy	Chalk and talk method/PowerPoint Presentation.

Module-3: Navier-Stoke's equation

Stoke's law, conservation of mass, derivation of Navier-Stoke's equations of motion of a viscous fluid (i) Cartesian coordinates and (ii) vector form. energy equation, conservation of energy, diffusion of vorticity, energy dissipation due to viscosity, vortex motion, circulation, Kelvin's circulation theorem, Helmholtz vorticity equation, performance in vorticity and circulation. **(8 Hours)**

Self-study: Kelvin's minimum energy theorem.

(RBT Levels: L1, L2 and L3)

Pedagogy	Chalk and talk method/PowerPoint Presentation.

Module-4: Exact solutions of the Navier-Stokes equation

Standard applications; i) Plane Poiseuille and Hagen Poiseuille flow ii) Couette flow iii) Steady flow between concentric cylinders iv) Slow and steady flow past a rigid sphere and cylinder. Standard applications, Stoke's first problem and second problem. **(8 Hours)**

Self-study: Beltrami flows.

(RBT Levels: L1, L2 and L3)

Pedagogy	Chalk and talk method/PowerPoint Presentation.

Module-5: Theory of laminar boundary layer concepts

Definition of laminar and turbulent, Two-dimensional boundary layer equations for flow over a plane wall, Prandtl's boundary layer concept, some definition of boundary layer thickness, displacement thickness, momentum thickness. **(8 Hours)**

Self-study: Boundary layer flow along a flat plate- Blasius solution.

(RBT Levels: L1, L2 and L3)

Pedagogy	Chalk and talk method/PowerPoint Presentation.

Course outcome (Course Skill Set)

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

- describe the concepts and equations of fluid dynamics.
- apply thermodynamic control volume concepts in fluid dynamics for applications that include momentum, mass and energy balances.
- analyse the approximate solutions of the Navier-Stokes equation.
- appreciate the role of fluid dynamics in day-to-day life.
- understand the concept of boundary layer theory and its applications

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE).

Continuous Internal Evaluation:

Three Unit Tests each of **20 Marks (duration 01 hour**)

1. First test at the end of 5th week of the semester
2. Second test at the end of the 10th week of the semester
3. Third test at the end of the 15th week of the semester

Two assignments each of **10 Marks**

4. First assignment at the end of 4th week of the semester
5. Second assignment at the end of 9th week of the semester

Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for **20 Marks** (**duration 01 hours**)

6. At the end of the 13th week of the semester

The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be **scaled down to 50 marks**

(to have less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course).

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 03 hours)**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.

Books Recommended

1. G. K. Bachelor: An Introduction to Fluid Mechanics, Foundation Books, New Delhi, (1994).
2. R. K. Rathy: An Introduction to Fluid Dynamics, Oxford and IBH Publishing Company, New Delhi, (1976)
3. D. J. Tritton, Physical fluid dynamics, Oxford Science publication, second edition, 1987.
4. S.W. Yuan, foundations of fluid mechanics, Third edition, Prentice-Hall International Inc. London.
5. Schlichting H., Boundary layer theory, McGraw-Hill, 1979.
6. Nield D. A. and Bejan A., Convection in porous media, Springer, 2006.
7. F. Chorlton: Text Book of Fluid Dynamics, CBS Publishers, New Delhi, (1985).
8. L. D. Landav and E. M. Lipschil: Fluid Mechanics, Pragamon Press, London, (1985)

Web links and Video Lectures (e-Resources):

- http://.ac.in/courses.php?disciplineID=111
- http://www.class-central.com/subject/math(MOOCs)
- http://academicearth.org/
- VTU EDUSAT PROGRAMME-20

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Quiz
- Group assignment
- Seminars

B. Sc. Honors (Mathematics)

Choice Based Credit System (CBCS) and Outcome Based Education (OBE)

SEMESTER - VII

Graph Theory			
Course Code	**21BSM751**	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	2:2:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03

Course objectives: This course will enable the students to:

1. Understand fundamental concepts of graphs, graph classes and graph operations and related results.
2. Be familiarized with the concepts and results on Eulerian graphs and Hamiltonian graphs.
3. Gain conceptual knowledge in the concepts of trees, binary trees and spanning trees.
4. Analyze the results on planar graphs and their properties.
5. Gain proof writing and algorithm writing skills.

Pedagogy **(General Instructions):**

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

1. In addition to the traditional lecture method, different types of innovative teaching methods may be adopted so that the delivered lessons shall develop students' theoretical and applied mathematical skills.
2. State the need for Mathematics Science Studies and Provide real-life examples.
3. Support and guide the students for self–study.
4. You will also be responsible for assigning homework, grading assignments and quizzes, and documenting students' progress.
5. Encourage the students for group learning to improve their creative and analytical skills.
6. Show short related video lectures in the following ways
   - As an introduction to new topics (pre-lecture activity).
   - As a revision of topics (post-lecture activity).
   - As additional examples (post-lecture activity).
   - As an additional material of challenging topics (pre-and post-lecture activity).
   - As a model solution for some exercises (post-lecture activity).

Module-1: Paths, Circuits and Graph Isomorphisms

Definition and examples of a graph, Subgraph, Walks, Paths and circuits; Connected graphs, disconnected graphs and components of a graph; Euler and Hamiltonian graphs, Graph Isomorphisms, Directed graphs and their elementary properties.
Semigraphs-paths and complete graphs. **(8 Hours)**
Self-study: Adjacency matrix and incidence matrix of a graph.

(RBT Levels: L1, L2 and L3)

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-2: Trees and Fundamental Circuits

Definition and properties of trees, Rooted and binary trees, Cayley's theorem on a counting tree, Spanning tree, Fundamental circuits, Minimal spanning trees in a connected graph. Kruskal's Algorithm, Prim's Algorithm. **(8 Hours)**
Self-study: Distance, Eccentricity and Center.

(RBT Levels: L1, L2 and L3)

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-3: Cut-Sets and Cut-Vertices

Cut-set of a graph and its properties, Fundamental circuits and cut-sets, Cut-vertices, Connectivity and separability, Network flows, 1- isomorphism. **(8 Hours)**
Self-Study: 2- isomorphism.

(RBT Levels: L1, L2 and L3)

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-4: Planar Graphs

Planar graph, Euler theorem for a planar graph, Various representations of a planar graph, Dual of a planar graph, Detection of planarity, Kuratowski's theorem. **(8 Hours)**
Self-Study: Abstract and Combinatorial Duals.

(RBT Levels: L1, L2 and L3)

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-5: Graph Coloring

Chromatic number of a graph, Chromatic partition, Chromatic polynomial, Matching and coverings, Four color problem. **(8 Hours)**
Self-Study: Five Color Theorem.

(RBT Levels: L1, L2 and L3)

Course outcomes: After successfully completion of the course, the students will be able:

- Appreciate the definition and basics of graphs along with types and their examples.
- Understand the definition of a tree and learn its applications to fundamental circuits.
- Know the applications of graph theory to network flows.
- Understand the notion of planarity and coloring of a graph.
- Relate the graph theory to the real-world problems.

Assessment Details (both CIE and SEE)
The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE).
Continuous Internal Evaluation:
Three Unit Tests each of **20 Marks** (**duration 01 hour**)
1. First test at the end of 5th week of the semester
2. Second test at the end of the 10th week of the semester
3. Third test at the end of the 15th week of the semester
Two assignments each of **10 Marks**
4. First assignment at the end of 4th week of the semester
5. Second assignment at the end of 9th week of the semester
Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for **20 Marks** (**duration 01 hours**)
6. At the end of the 13th week of the semester
The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be **scaled down to 50 marks**
(to have less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course).
CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.
Semester End Examination:
Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 03 hours)**
1. The question paper will have ten questions. Each question is set for 20 marks.

2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
The students have to answer 5 full questions, selecting one full question from each module.

Text/Reference Books

1. R. Balakrishnan & K. Ranganathan (2012). A Textbook of Graph Theory. Springer.
2. Narsingh Deo (2016). Graph Theory with Applications to Engineering and Computer Science. Dover Publications.
3. Reinhard Diestel (2017). Graph Theory (5th edition). Springer.
4. Edgar G. Goodaire & Michael M. Parmenter (2018). Discrete Mathematics with Graph Theory (3rd edition). Pearson.
5. Douglas West (2017). Introduction to Graph Theory (2nd edition). Pearson.
6. F. Harary: Graph Theory, Addison -Wesley, 1969
7. J. A. Bondy and V.S.R. Murthy: Graph Theory with Applications, Macmillan, London, 2004.
8. D. B. West, Introduction to Graph Theory, Pearson Education Asia, 2nd Edition, 2002.
9. E Sampathkumar(2019). Semigraphs, Academy of Discrete Mathematics and Applications.

Web links and Video Lectures (e-Resources):

http://www.class-central.com/subject/math(MOOCs)
http://academicearth.org/
http://www.bookstreet.in.
VTU EDUSAT PROGRAMME – 20
VTU e-Shikshana Program

Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning

- Quiz
- Group assignment and
- Seminars

B. Sc. Honors (Mathematics)

Choice Based Credit System (CBCS) and Outcome Based Education (OBE)

SEMESTER - VII

Tensor Analysis and Differential Geometry			
Course Code	**21BSM752**	CIE	50
Teaching Hours/Week (L:T:P: S)	2:2:0:0	SEE	50
Total Hours of Pedagogy	40	Total	100
Credits	3	Exam Hours	3hrs

Course Learning objectives: The course will enable students to:

1. Familiarize with basic concepts of Tensors.
2. Learn the centre of gravity of some materialistic systems and the properties of common catenary.
3. Understand the kinematics and kinetics of the rectilinear motions.
4. Derive the equations of motion of a particle under various conditions.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. In addition to the traditional lecture method, different types of innovative teaching methods may be adopted so that the delivered lessons shall develop student's theoretical and applied mathematical skills.
2. State the need for Mathematics with Engineering Studies and Provide real-life examples.
3. Support and guide the students for self-study.
4. You will also be responsible for assigning homework, grading assignments and quizzes, and documenting students' progress.
5. Encourage the students for group learning to improve their creative and analytical skills.
6. Show short related video lectures in the following ways:
    - As an introduction to new topics (pre-lecture activity).
    - As a revision of topics (post-lecture activity).
    - As additional examples (post-lecture activity).
    - As an additional material of challenging topics (pre-and post-lecture activity).
    - As a model solution of some exercises (post-lecture activity).

Module-1: Tensors

Contravariant and covariant vectors, Transformation formulae, Tensor product of two vector spaces, Tensor of type (r, s), Symmetric and skew-symmetric properties, Contraction of tensors, Quotient law.

Self-Study: Inner product of vectors. **(8 Hours)**

RBT Levels: L1, L2 and L3

Pedagogy	Chalk and talk method/PowerPoint Presentation.

Module-2: Centres of Gravity and Common Catenary

Centres of gravity of plane area including a uniform thin straight rod, triangle, circular arc, semi-circular area and quadrant of a circle, Centre of gravity of a plane area bounded by a curve, Centre of gravity of a volume of revolution; Flexible strings, Common catenary, Intrinsic and Cartesian equations of the common catenary.

Self-Study: Approximations of the catenary. **(8 Hours)**

RBT Levels: L1, L2 and L3

Pedagogy	Chalk and talk method/PowerPoint Presentation.

Module-3: Rectilinear Motion

Simple harmonic motion (SHM) and its geometrical representation, SHM under elastic forces, Motion under inverse square law, Motion in resisting media, Motion of varying mass.

Self-Study: Concept of terminal velocity. **(8 Hours)**

RBT Levels: L1, L2 and L3

Pedagogy	Chalk and talk method/Power Point Presentation.

Module-4: Motion in a Plane

Kinematics and kinetics of the motion, Expressions for velocity and acceleration in Cartesian, polar and intrinsic coordinates; Motion in a vertical circle, projectiles in a vertical plane.
Self-Study: Projectiles in a cycloidal motion. **(8 Hours)**
RBT Levels: L1, L2 and L3

Pedagogy	Chalk and talk method/PowerPoint Presentation.

Module-5: Central Orbits

Equation of motion under a central force, Differential equation of the orbit, (p, r) equation of the orbit, Apse and apsidal distances, Areal velocity, Kepler's laws of planetary motion.
Self-Study: Characteristics of central orbits. **(8 Hours)**
RBT Levels: L1, L2 and L3

Pedagogy	Chalk and talk method/PowerPoint Presentation.

Course outcome (Course Skill Set)

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

- Familiarize with the subject matter, which has been the single centre, to which were drawn mathematicians, physicists, astronomers, and engineers together.
- Understand the necessary conditions for the equilibrium of particles acted upon by various forces and learn the principle of virtual work for a system of coplanar forces acting on a rigid body.
- Determine the centre of gravity of some materialistic systems and discuss the equilibrium of a uniform cable hanging freely under its own weight.
- Deal with the kinematics and kinetics of the rectilinear and planar motions of a particle including the constrained oscillatory motions of particles.
- Learn that a particle moving under a central force describes a plane curve and know Kepler's laws of the planetary motions, which were deduced by him long before the mathematical theory given by Newton.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE).

Continuous Internal Evaluation:

Three Unit Tests each of **20 Marks (duration 01 hour**)

1. First test at the end of 5th week of the semester
2. Second test at the end of the 10th week of the semester
3. Third test at the end of the 15th week of the semester

Two assignments each of **10 Marks**

4. First assignment at the end of 4th week of the semester
5. Second assignment at the end of 9th week of the semester

Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for **20 Marks** (**duration 01 hour**)

6. At the end of the 13th week of the semester

The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be **scaled down to 50 marks**

(to have less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course).

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 03 hours)**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.

Books Recommended

1. S. L. Loney (2006). *An Elementary Treatise on the Dynamics of a Particle and of Rigid Bodies*. Read Books.
2. P. L. Srivatava (1964). *Elementary Dynamics*. Ram Narin Lal, Beni Prasad Publishers Allahabad.
3. J. L. Synge & B. A. Griffith (1949). *Principles of Mechanics*. McGraw-Hill.
4. A. S. Ramsey (2009). *Statics*. Cambridge University Press.
5. A. S. Ramsey (2009). *Dynamics*. Cambridge University Press.
6. R. S. Varma (1962). *A Text Book of Statics*. Pothishala Pvt. Ltd.

Web links and Video Lectures (e-Resources):

- http://.ac.in/courses.php?disciplineID=111
- http://www.class-central.com/subject/math(MOOCs)
- http://academicearth.org/
- VTU EDUSAT PROGRAMME-20

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Quiz
- Group assignment
- Seminars

VII Semester

GEOGRAPHY			
Course Code	21BSO761	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	2:0:0	SEE Marks	50
Total Hours of Pedagogy	25	Total Marks	100
Credits	02	Exam Hours	03

CLO 1	To introduce students to basic concepts of geography and several up-to-date issues which are widely discussed in the field of geography.
CLO 2	To provide an overview of the major branches of physical geography and their interconnections
CLO 3	Ability to interpret the distribution and processes of physical and human phenomena.
CLO 4	Provide an understanding of the definitions and concepts related to natural hazards and disaster risk reduction.
CLO 5	To identify economic patterns across space and time in order to provide insight into how and why economic systems and practices develop.

Pedagogy (General Instructions)

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) does not mean only traditional lecture method, but different type of teaching methods may beadopted to develop the outcomes.
2. Show Video/animation films to convince abstract concepts.
3. Encourage collaborative (Group Learning) Learning in the class
4. Ask at least three HOTS (Higher order Thinking) questions in the class, which promotes critical thinking
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as theability to evaluate, generalize, and analyze information rather than simply recall it.
6. Topics will be introduced in a multiple representation.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creativeways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

Module-1: Introduction to Geography

Introduction, Defining Geography, Nature and Scope of Geography, Branches of Geography, Spatial Distribution of Phenomenon, Importance of Physical Geography and Human Geography.

Pedagogy	**Chalk and talk/power point presentation:Videos/Learning material:**

Module-2: Physical Geography

Weathering, factors affecting weathering; Concept of cycle of erosion; works of running water, wind and glaciers; Karst and coastal regions; Drainage patterns, lakes and islands. Elements of weather and climate; Composition and structure of the atmosphere; Insolation, heat budget, vertical, horizontal and seasonal distribution of temperature.

Pedagogy	**Chalk and talk/power point presentation:Videos/Learning material:**

Module-3: Environmental Geography

Principle of ecology; Human ecological adaptations; Influence of man on ecology and environment; Global and regional ecological changes and imbalances; Ecosystem their management and conservation; Environmental degradation, management, and conservation; Biodiversity and sustainable development; Environmental policy; Environmental hazards and remedial measures; Environmental education and legislation.

Pedagogy	**Chalk and talk/power point presentation:Videos/Learning material:**

Module-4: Perspectives in Human Geography

Areal differentiation; regional synthesis; Dichotomy and dualism; Environmentalism; Quantitative revolution and locational analysis; Radical, behavioral, human, and welfare approaches; Languages, religions, and secularization; Cultural regions of the world; Human development index.

Pedagogy	**Chalk and talk/power point presentation:Videos/Learning material:**

Module-5: Economic Geography

World economic development: measurement and problems; World resources and their distribution; Energy crisis; the limits to growth; World agriculture: a typology of agricultural regions; Agricultural inputs and productivity; Food and nutrition problems; Food security; famine: causes, effects, and remedies; World industries: location patterns and problems; Patterns of world trade.

Pedagogy	**Chalk and talk/power point presentation:Videos/Learning material:**

Course outcome (Course Skill Set)

At the end of the course the student will be able to:

CO 1: Explain the meaning, definitions, nature, and scope of physical geography and identify and describe the branches of physical geography.

CO 2: Examine the origin, shape, and size of the earth, and the effects of the movement of the earth, coordinates -latitude, longitude, and time.

CO 3: Discuss the major environmental issues facing the earth system, including global warming, greenhouse effect, ozone depletion, floods, droughts, weather variations, changing ecosystems, snow/glaciers melting, and impact of pollution.

CO 4: Define and explain key concepts related to natural hazards and disaster risk Reduction.

CO 5: Understand the process of recovery and reconstruction following a disaster.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination(SEE).

Continuous Internal Evaluation:

Three Unit Tests each of **20 Marks (duration 01 hour**)

1. First test at the end of 5th week of the semester
2. Second test at the end of the 10th week of the semester
3. Third test at the end of the 15th week of the semester

Two assignments each of **10 Marks**

4. First assignment at the end of 4th week of the semester
5. Second assignment at the end of 9th week of the semester

Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for **20 Marks** (**duration 01hours**)

6. At the end of the 13th week of the semester

The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be **scaleddown to 50 marks**
(to have less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE.Each method of CIE should have a different syllabus portion of the course).
CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcomedefined for the course.
Semester End Examination:
Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject(**duration 03 hours)**
1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
The students have to answer 5 full questions, selecting one full question from each module.

Suggested Learning Resources:

- A.M. Patwardhan ., (2012),' The Dynamic Earth System', Prentice Hall India Learning Private Limited; Third edition
- B.S. Negi., (1993), 'Physical Geography', S.J. Publication, Meerut.
- D.S. Lal., (1998), 'Climatology' Chaitnya publishing house, Allahabad.
- K. Siddhartha., (2001), 'Atmosphere, Weather and Climate', Kisalaya publication, New Delhi.
- R.N. Tikka., (2002), 'Physical Geography' Kedarnath Ramnath & Co, Meerut.
- Robinson, H. et al (1995): Elements of Cartography, 6th Edition, John Wiley & Sons, New York.
- Strahler, A.N., (2005), 'Physical Geography', Wiley Publications., 3rd Ed.
- W. Kenneth Hamblin & Eric H. Christiansen., (2003), 'Earth's Dynamic Systems' Pearson; 10th edition.
- Monkhouse, F.J.R. & Wilkinson H.R.(2000):Maps and Diagrams, Methuen &Co. London.
- Mishra, R.P. (1973): Fundamentals of Cartography, Prasaranga, University of Mysore
- Rampal, K.K.(1993): Mapping and Compilation, Concept Publishing Co.New Delhi.

Web links and Video Lectures (e-Resources):

1. https://www.youtube.com/watch?v=qLnQlLcwoxM
2. https://www.youtube.com/watch?v=625W7bwB5GY

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning
https://wiki.millersville.edu/display/ittac/Geography+Virtual+Lab+Instructions

VII Semester

Mass Communication and Journalism			
Course Code	**21BSO762**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	2:0:0	SEE Marks	50
Total Hours of Pedagogy	25	Total Marks	100
Credits	02	Exam Hours	03

CLO 1	To introduce students to basic concepts of mass communication and journalism and several up-to-date issues which are widely discussed in the field of mass communication and journalism.
CLO 2	Explain the concepts and process of communication.
CLO 3	Understand the theories and models of communication.
CLO 4	Elucidate News report and Feature writing
CLO 5	Understand the writing for the web.

Pedagogy (General Instructions)

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) does not mean only traditional lecture method, but different type of teaching methods may beadopted to develop the outcomes.
2. Show Video/animation films to convince abstract concepts.
4. Encourage collaborative (Group Learning) Learning in the class
5. Ask at least three HOTS (Higher order Thinking) questions in the class, which promotes critical thinking
6. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as theability to evaluate, generalize, and analyze information rather than simply recall it.
7. Topics will be introduced in a multiple representation.
8. Show the different ways to solve the same problem and encourage the students to come up with their own creativeways to solve them.
9. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

Module-1: Communication: Concepts and Process

Nature and process of human communication, functions of communication, verbal and non- verbal communication, intra-personal, inter-personal, small group, public and mass communication. Nature and process of mass communication, media of mass communication, characteristics and typology of audiences. Social Functions of Mass Communication, Scope of Mass Communication.

Pedagogy	**Chalk and talk/power point presentation:Videos/Learning material:**

Module-2: Communication Theories

Authoritarian; Libertarian; Socialistic; social-responsibility; Normative theories; Development media theory; Democratic participation media theory.

Pedagogy	**Chalk and talk/power point presentation:Videos/Learning material:**

Module-3: Communication Models

Overview of the importance of communication models, Understanding the role of following models in the study of communication: Lasswell, Shannon and Weaver, Osgood, Dance, Schramm, Gerbner, Newcomb, Wesley and Maclean model.

Pedagogy	**Chalk and talk/power point presentation:Videos/Learning material:**

Module-4: Writing for Print

Basics of writing a news report: Structuring a news report- 5 W's and H, Intro/ Lead, Inverted Pyramidand other news structures, Dateline. Feature writing, book reviews. Opinion and editorial writing.

Pedagogy	**Chalk and talk/power point presentation:Videos/Learning material:**

Module-5 Writing for the Web

Basics of writing for online media- structure and contentWriting stories for internet, editing and rewriting

Pedagogy	**Chalk and talk/power point presentation:Videos/Learning material:**

Course outcome (Course Skill Set)

At the end of the course the student will be able to:

CO 1	Discuss the basics concepts of mass communication and journalism.
CO 2	Understand the communication theories and models.
CO 3	Understand the basics of writing a news report and Feature writing.
CO 4	To be able to write for online media.
CO 5	To be able to write stories for internet and carry out editing and rewriting.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination(SEE).

Continuous Internal Evaluation:

Three Unit Tests each of **20 Marks (duration 01 hour**)

1. First test at the end of 5th week of the semester
2. Second test at the end of the 10th week of the semester
3. Third test at the end of the 15th week of the semester

Two assignments each of **10 Marks**

4. First assignment at the end of 4th week of the semester
5. Second assignment at the end of 9th week of the semester

Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for **20 Marks** (**duration 01hours**)

6. At the end of the 13th week of the semester

The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be **scaleddown to 50 marks**

(to have less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE.Each method of CIE should have a different syllabus portion of the course).

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcomedefined for the course.

Semester End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject(**duration 03 hours)**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module

(with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
The students have to answer 5 full questions, selecting one full question from each module.

Suggested Learning Resources:

Books

1. McQuail, D., McQuail's Mass Communication Theory, Vistar Publications New Delhi, 2009
2. Baran, J.S. and Dennis K. Davis, Mass Communication Theory: Foundations, Ferment, and Future,Thomson Wadsworth, Noida, 2007
3. Becker, S. L., Discovering Mass Communications, Scott, Foresman, Glenview, 1987
4. Berger, A. A., Essentials of Mass Communication, Sage, New Delhi, 1995
5. McLuhan, M., Understanding Media, Mentor, London, 1980
6. Wright, C. R., Mass Communication and Sociological perspectives, Random House, New York,1986
7. Kumar, K. J., Mass communication in India, 1995
8. D.R. Williamson, Feature Writing for Newspaper Fiske, J., An introduction to Communication,Routledge, 1990
9. Fiske, J., An introduction to Communication, Routledge, 1990
10. Introduction to Online Journalism: Publishing News and Information by Ronald De Walk.
11. J. J. Astor, Art of Modern Journalism
12. Journalism in the 21st Century: Online Information, Electronic Databases and the News by TomKoth (Adamantine Press Ltd.)
13. K. M. Srivastava, News Reporting & Editing
14. M. V. Charnley, Reporting
15. M.V. Kamath, Professional Journalism

Web links and Video Lectures (e-Resources):

1. https://www.youtube.com/watch?v=QcnI7o2n2MI
2. https://www.youtube.com/watch?v=QdL6RTaB5qk
3. https://www.youtube.com/watch?v=aSVxsXMdTlw

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- https://communication.depaul.edu/about/initiatives/center-for-communication-engagement/Pages/varc-lab.aspx