Far Western University
Faculty of Education
Mathematics Education

Course Title: Real Analysis I
Course No.: Math.Ed.243
Level: B.Ed.
Semester: 4th

Nature of course: Theory
Credit Hour: 3
Total periods: 48
Time per period: 1 hour

1. Course Introduction

This course consists of fundamental ideas of Real Analysis. It starts with logic which is the foundation of the remaining chapters. Then real numbers are introduced in axiomatic way in the second unit. Then, open sets and closed sets are included which are very important concepts in Real Analysis and topology. The course ends with the tests concerning series. This course is the foundation for other courses like Real analysis II and Mathematical Analysis. Moreover, it develops knowledge and skills of proving theorems based on the axioms and definitions.

2. General Objectives

At the end of the course the students are expected to achieve the following objectives:

- To demonstrate understanding and skills of logical rules and proving methods.
- To appreciate the beauty of real numbers by grasping the idea that it is an axiomatic system.
- To demonstrate understanding and skills associated with open sets and closed sets.
- To develop ideas and skills of convergence and divergence of real sequences.
- To demonstrate skills of applying several tests for convergence of series.
- To engage in constructing knowledge and developing skills associated with several concepts, theorems, and solving problems of Real Analysis.

3. Course Contents and Specific Objectives

Specific Objectives	Content
• To construct truth table of different compound statements and apply them in identifying truth values. • To state and prove different rules of logical equivalence using truth tables. • To describe universal quantifier and existential quantifiers; determine truth values of quantified statements; and forming negation of quantified statements. • To explain the meaning of rules of inferences • To explain different proof strategies (direct proof and indirect proofs) with illustrations.	**Unit I: Logic and Proofs** [6] 1.1 Propositional logic 1.2 Propositional equivalences 1.3 Quantifiers 1.5 Rules of inferences 1.6 Proofs and proof strategies
• To explain the meaning of field axioms and order axioms of real numbers and construct proofs of associated properties. • To derive some fundamental results of absolute value of a real number • To explain the concepts of bounded set, supremum, and infimum of a set. • To prove properties associated with boundedness,	**Unit II: Real Numbers** [6] 2.1 Field Axioms and order axioms of set of real numbers 2.2 Absolute value of real numbers 2.3 Boundedness of subsets of $\mathbb{R}$ 2.4 Completeness axiom in $\mathbb{R}$ 2.5 Archimedian property, Dedikinds property, and denseness properties in $\mathbb{R}$

supremum, and infimum. • To explain the completeness axiom in $\mathbb{R}$ and apply it proving some associated theorems. • To prove Archimedean property, Dedikind's property, and denseness properties in $\mathbb{R}$. • To explore the one to one correspondence of real numbers and points in a straight line.	2.6 Real number line
• To explain open intervals, semiopen intervals, closed intervals, and infinite intervals with examples. • To describe the concept of neighbourhood and prove associated properties. • To determine interior point, exterior point, boundary points, adherent points of subsets of real numbers. • To explain open set and closed sets and prove associated theorems. • To describe the concept of a limit point of a set and prove associated properties. • State and prove Bolzano…Weierstrss theorem for sets. • To prove properties associated with derived set and closure of a set.	**Unit III: Open and Closed Sets in** $\mathbb{R}$[8] 3.1 Intervals 3.2 Neighbourhoods 3.3 Interior, exterior, and boundary of a set. 3.4 Open Sets 3.5 Limit point of a set 3.6 Closed sets
• To explain the concept of a real sequence with examples. • To explain the concept of bounded sequence and determine boundedness of sequences. • To explain the concept of limit points of sequences and prove associated properties. • To describe concept of convergent sequence and Cauchy's sequence and derive the relationship between these concepts. • To explain the concept of divergent sequence and oscillatory sequences and construct their examples. • Prove some theorems on limits including Sandwich theorem. • To explain monotonic sequence and prove associated theorems. • To describe concept of subsequence and prove associated theorems.	**Unit IV: Real Sequences** [12] 4.1 Introduction of a real sequence 4.2 Boundedness of sequences 4.3 Limit points of a sequence 4.4 Convergent sequences 4.5 Divergent sequences 4.6 Oscillatory sequences 4.7 Monotonic sequences 4.8 Subsequences
• To explain the concept of an infinite series and its convergence. • To state and prove Cauchy's general principle of convergence of series • Prove necessary condition for convergence and sufficient condition for divergence of series. • To explain different tests associated with different types of series. • To prove different tests associated with different types of series. • To apply different tests to determine convergence of	**Unit V: Infinite Series** [16] 5.1 Meaning of an infinite series 5.2 Cauchy's general principle of convergence of series 5.3 Series of positive terms (Comparison test, D'Alembert ratio test, Cauchy's nth root test) 5.4 Higher ratio tests (Rabies test, Kummer's test, Logarithmic ratio test) 5.5 Alternating series

particular series. • To explain the concept of infinite product and explain its convergence. • To prove Cauchy's general principle of an infinite product of series.	(Leibniz test) 5.6 Absolutely convergent series and conditionally convergent series 5.7 Series of terms of arbitrary signs (Dirichlet's test, Abel's test, Dirichlet's theorem) 5.8 Infinite product and its convergence

4. Methodology and Techniques

- Teachers are suggested to facilitate in a sequence of **example to generalization.**
- Teachers are suggested to **visualize** every concept as far as possible**.**
- Engage students in drawing activities and establishing link between real line representation and symbolic definitions.
- Teachers are suggested to engage students in constructing **multiple representations** of the same concepts and **making connection** between such representations.
- Discuss sufficiently on the **prerequisite** concepts, methods of proof, and sketching of proof before starting to write proof of the theorem.
- Inquiry Based Learning to develop proof of the theorems.
- Constructivist approach to develop conceptual understanding of concepts.
- Project-Based Learning to facilitate application aspect of theorems.
- Problem Based Learning to help students solve some problems in the exercises.
- Support students in their ZPD using constructivist perspective.
- **Exploration**: Help students to explore the essence of concepts and theorems.
- Use collaborative learning methods together with expository-based demonstration methods as per the nature of the content.
- **Discussion:** discuss the application of the theorems/formulas and ask students to solve the problems applying theorems.

5. Evaluation Scheme

5.1 **Internal Evaluation (40%)**

Internal Evaluation will be conducted by course teacher based on following activities.

a) **Attendance and Participation in class activities**: **5+5= 10 marks**

b) **Assignment I: Reflective Notes and Class presentation:** **5+5= 10 marks**
(Reflective notes on 2 to 4 questions given by teacher at the end of the every unit and presentation on any two questions among them)

c) **Assignment II**: **one Term paper/ Essay/Project and Interview:** **5+5=10 marks**
(Logical essay/term paper/project on the topics chosen by students and approved by the teacher and interview)

d) **Mid-term exam:** **10 marks**

Description of the Internal Evaluation

Mid-term exam*:* ***Engagement in a Class:*** Marks will be assigned based on attendance and engagement in the classroom activities. At least 80% percent of class attendance is mandatory for the students to enable them to appear in the End-Term examination. Below 80% in attendances that signify is NOT QUALIFIED (NQ) in subject to attend the end term examination.

Reflective Journal: It is individual work. Each student must submit their reflective journal of each chapter or teacher will give some questions that need reflective activities. The reflective journal will be returned to the students after its evaluation. Each student needs to make a presentation on their reflective journal.

Term paper*:* It is individual work. It must be prepared by the use of a computer in a standard format of academic writing and must contain at least 5 pages. Quality, format, and time of submission will be the major criteria of the evaluation. The teacher will interview of students based on their term paper.

Project Work: Students will be divided into groups. Each group will be assigned the project concerning application of theorems. Each group will present their findings to the whole class.

Mid-Term Examinations: It is a written examination, and the questions will be set covering the topics as taught in the sessions. Mid-term examination will be based on the model prescribed for End-term examination.

5.2 External Evaluation (60%)

External Examinations: It is also a written examination, and the questions will be asked covering all the topics in the session of the course. It carries 60 marks.

End Semester Examination Model

Nature of question	Total questions to be asked	Total questions to be answered	Total marks
Group A: Multiple choice	10 questions	10	10×1 = 10
Group B: Short answer type question	6 with 2 'or' questions	6	6×5 = 30
Group C: Long answer type question/case studies	2 with 1 'or' question	2	2×10 =20
Total			**60**

Recommended Books

Gupta, S. L. and Rani, N. (2010). *Fundamental real analysis (4th*). New Delhi: Vikash Publishing House. **(units 2 to 5)**

Rosen, K. H. (2012). *Discrete Mathematics and its applications (7th ed).* McGraw Hill Companies **(unit 1)**

Reference Books

Malik, S.C. and Arora, S. (2010). *Mathematical analysis (4th*). New Delhi: New Age International Pvt. Ltd.

Maskey, S.M. (2007). *Principles of real analysis*. (2nd). Ratna Pustak Bhandar

Pandey, U. N. (2024). Real Analysis. Vidyarthi Pustak Bhandar.

Far Western University

Faculty of Education

Mathematics Education

Course Title: Analytical Geometry
Course Code: Maths.Ed.244
Level: Undergraduate
Semester: IV

Nature of Course: Theory
Credits: 3
Teaching Hours: 48
Time Per Period: 1 Hrs

1. Course Description

This course is designed for undergraduate students to develop their acquaintance with fundamental principles, approaches and techniques of analytic geometry of two and three dimensions. This course provides basic knowledge of transformation of coordinates, the conic sections (ellipse and hyperbola) and their properties and the general equation of second degree in two dimensions. In three dimensions, this course includes plane, straight line, sphere and cone and cylinder. The course emphasizes both theoretical and applicable aspects of the content so that students may use their geometrical skills developed in different fields.

2. Course Objectives

This course aims to make students understand and apply the basic geometrical concepts, principles, approaches and formulae developed in two dimensions and three dimensions in practical problems in different related fields. This course also aims to enable students to use algebraic approach in geometrical reasoning and problem solving of two and three-dimensional situations.

Learning Outcomes: After studying the course, the students will be able to:

1. acquire the basic concepts and develop idea about transformation of coordinates in two dimensions.
2. explain the formation of different types of conic section by the section of a right circular cone and define formally.
3. to derive equations of conic sections (ellipse and hyperbola) in different forms, derive different properties and develop different related concepts.
4. enable students to know about general equation of second degree.
5. develop idea to coordinatize the points in space and hence derive transformed relations.
6. to understand plane, line in three dimensions; find their equations and develop related concepts.
7. enable students to know about sphere, cone and cylinder along with related derivations.

3. Contents in Detail with Specific Objectives

• Understand the meaning and develop the concepts of coordinate system needed in geometry. • Develop the technique of shifting of origin, the axes remaining parallel to the original system (Translation). • To describe the change in direction of the axes without changing the origin(Rotation). • To describe the transformation in which there is both translation and rotation.	**Unit 1. Transformation of Coordinates [4 Hrs.]** 1.1 Introduction 1.2 Translation of coordinates 1.3 Rotation of coordinates 1.4 Translation and Rotation 1.5 Invariants 1.6 Missing first-degree terms 1.7 Removal of term containing xy 1.8 Related exercises

• To understand the concept of invariant and derive properties under transformation. • To develop the technique of missing the first-degree terms. • To find the angle so that the term containing xy be removed after transformation.	
• Explain the formation of different conic sections by the section of right circular cone. • Discuss about conic sections of different type. • Derive the standard equation of ellipse and hyperbola. • State the different terminologies related to ellipse and hyperbola. • Derive formulae related to the sum and difference of focal distances of a point. • Define tangent and normal at a point on a curve and derive the equations of tangent and normal for ellipse and hyperbola. • Derive formulae for chord of contact. • Define pole and polar of a conic and state their properties. • Find the equation of asymptotes to hyperbola. • Derive relations between the equations of hyperbola, its asymptotes and the conjugate hyperbola. • Derive polar equation of conic section with focus being pole.	**Unit 2. Conic Sections [10 Hrs.]** 2.1 Introduction 2.2 Ellipse 2.2.1 Equation of ellipse in standard form 2.2.2 Sum of focal distances of a point on ellipse 2.2.3 Polar equation of ellipse 2.2.4 Equation of tangent and normal at any point 2.3 Hyperbola 2.3.1 Standard equation of hyperbola 2.3.2 Equation of tangent and normal 2.3.3 Chord of contact 2.3.4 Pole and Polar: Definition and properties 2.3.5 Asymptotes of hyperbola 2.3.6 Relation between the equation of a hyperbola, its asymptote and the conjugate hyperbola 2.3.7 Polar equation of conic section with focus being
• Define general equation of second degree in two variables. • Discuss general equation of second degree and the conic represented by them. • Find the axis, tangent at vertex, length of latus rectum, coordinates of vertex and focus of the parabola represented by the general equation of second degree. • Discuss the nature and centre of conic. • Derive equation of tangent and find the condition of tangency. • Discuss director circle of conic. • Derive equation of normal to the conic. • Derive equation of pole and polar of a conic.	**3. General Equation of the Second Degree** 3.1 General equation of second degree and the conics represented by them. 3.2 Nature of conic 3.3. Axis and latus rectum of parabola 3.4 Centre of conic 3.5 Equation of tangent and condition of tangency 3.6 Director Circle 3.7 Equation of normal to a conic 3.8 Equation of pole and polar with respect to a conic

• Develop the knowledge to coordinate the points in space. • Memorize important formulae related to coordinates in space like distance formula, section formula, mid-point formula etc. • Find the angle between two straight lines. • Define direction cosines of a line and state relation between direction cosines of a line. • Define direction ratios/numbers and state relation between direction ratios and direction cosines. • Define plane and find its general equation. • Derive equation of plane in normal and intercept forms. • Reduce the general equation of plane to a normal form. • Derive equation of plane through three points. • Derive equation of plane through intersection of two planes. • Discuss pair of planes and find angle between two planes represented by $ax^2 + by^2 + cz^2 + 2fyz+2gzx + 2hxy = 0$.	**Unit 4: Coordinates in Space and Plane [7 Hrs.]** 4.1 Introduction 4.2 Distance formula, section formula and mid-point formula 4.3 Angle between the straight lines 4.4 Direction cosines of a line and relation between direction cosines of a line. 4.5 Direction ratios 4.6 Projection 4.7 Introduction of plane 4.8 Equation of plane in normal and intercept form 4.9 Reduction of general equation of plane to normal form 4.10 Angle between two planes 4.11 Plane through three points 4.12 Plane through intersection of two planes 4.13 Pair of planes and angle between two planes represented by $ax^2 + by^2 + cz^2 + 2fyz + 2gzx + 2hxy = 0$
• Introduce straight lines in space. • Derive equation of straight line in symmetrical form. • Find length of perpendicular from a point to a line. • Transform the equation of line from general form to the symmetrical form. • Find a relation for angle between a line and a plane. • Derive a condition for a line to lie on a plane. • Define coplanar lines and find the equation of plane containing the lines in different form. Find the shortest distance between two lines in different form.	**Unit 5: Straight Lines in Space [7 Hrs.]** 5.1 Introduction to straight lines in space 5.2 Equation of a line in symmetrical form 5.3 Length of perpendicular from a point to a line 5.4 Transformation of the equation of line from general from to the symmetrical form 5.5 Angle between a line and a plane 5.6 Condition for a line to lie in a plane 5.7 Co-planar lines 5.8 The shortest distance 5.9 Exercises
• Define sphere. • Derive different forms of equations of sphere. • Derive equation for sphere passing through four points. • Discuss plane section of a sphere. • Derive equations of sphere in diameter form. • Discuss intersection of two spheres and find the equation of sphere through the intersection. • Derive equation of tangent plane to the sphere at any point. • State and derive condition of tangency	**Unit 6: The Sphere [7 Hrs.]** 6.1 Introduction 6.2 Equation of a sphere for given center and radius 6.3 General equation of sphere 6.4 Sphere through four given points 6.5 Plane section of sphere 6.6 Equation of a sphere in diameter form 6.7 Intersection of two spheres 6.8 Equation of tangent plane 6.9 Condition of tangency

• Discuss the generation of cone and cylinder. • Define cone and cylinder. • Derive the equation of cone with given vertex at origin. • Discuss the condition for the given equation of second degree to represent a cone. • Find the angle between lines in which a plane cuts a cone. • Find the condition that a cone may have three mutually perpendicular generators. • Discuss tangent lines and tangent planes. • State and derive condition of tangency. • Define reciprocal, enveloping and right circular cone and find their equations. • Derive equation of the cylinder through a given conic. Derive the equations of enveloping and right circular cylinder.	**Unit 7: Cone and Cylinder [8 Hrs.]** 7.1 Definition 7.2 Cone with given vertex at origin 7.3 Condition for the given equations of second degree to represent a cone 7.4 Angle between lines in which a plane cuts a cone 7.5 Condition that the cone has three mutually perpendicular generators 7.6 Tangent lines and tangent planes 7.7 Condition of tangency 7.8 Reciprocal, enveloping and right circular cones 7.9 Cylinder 7.10 Equation of the cylinder through a given conic 7.11 Enveloping and right circular cylinders

4. Methodology and Techniques

- Teachers need to focus on the development of students' concepts by using demonstrating/physically available materials, skill of proving theorems and understanding principles.
- Comparatively more focus should be given in developing skills.
- Follow the suggestions regarding content in the syllabus and recommend books for the uniformity.
- Discuss the main concepts of the course, engage them in developing skills through examples, and engage them in developing proof of theorems through discussion method.
- Demonstrate the meaning of theorem with help of example and then apply Inquiry Based Learning or any constructivist method to develop proof of the theorems.
- Teachers are suggested to engage students in illustrating theorems by taking suitable examples.
- Assign several questions from the recommended books as homework assignments.
- Constructivist approach to develop conceptual understanding of concepts.
- Project-Based Learning to facilitate application aspect of theorems in different disciplines.
- Support students in their ZPD using constructivist perspective.
- Exploration: Help students to explore the essence of concepts and theorems.
- Emphasize collaborative learning methods.
- Expository-based demonstration methods might be helpful in some content.
- Discussion: discuss the application of the theorems/formulas and ask students to solve the problems applying theorems.

Evaluation Scheme

Internal Evaluation (40%)

Internal Evaluation will be conducted by course teacher based on following activities:

a**) Attendance and Participation in class activities:** 5+5= 10 marks

b) Assignment I: Reflective Notes and Class presentation: 5+5= 10 marks

(Reflective notes on 2 to 4 questions given by teacher at the end of every unit and presentation on any two questions among them)

c) Assignment II: one Term paper/ Essay/Project and Interview: 5+5=10 marks

(Logical essay/term paper/project on the topics chosen by students and approved by the teacher and interview)

d) **Mid-term exam:** 10 marks

Description of the Internal Evaluation

Mid-term exam: Engagement in a Class: Marks will be assigned based on the attendance and engagement in the classroom activities. At least 80% percent class attendance is mandatory for the students to enable them to appear in the End-Term examination. Below 80% in attendances that signify is NOT QUALIFIED (NQ) in subject to attend the end term examination.

Reflective Journal*:* It is individual work. Each student must submit their reflective journal of each chapter or teacher will give some questions that need reflective activities. The reflective journal will be returned to the students after its evaluation. Each student needs to make presentation on their reflective journal.

Term paper: It is individual work. It must be prepared by the use of computer in a standard format of academic writing and must contain at least 5 pages. Quality, format, and time of submission will be the major criteria of the evaluation. Teacher will take interview of students based on their term paper.

Project Work*:* Students will be divided into groups. Each group will be assigned the project concerning application of theorems. Each group will present their findings in the whole class.

Mid-Term Examinations: It is a written examination, and the questions will be set covering the topics as taught in the sessions. Mid-term examination will be based on the model prescribed for End-term examination.

External Evaluation (60%)

External Examinations: It is also a written examination, and the questions will be asked covering all the topics in the session of the course. It carries 60 marks.

End Semester Examination Model

Nature of Question	**No. of Questions to be asked**	**No. of Questions to be answered**	**Total Marks**
Group A: Multiple Choice	10	10	10×1=10
Group B: Short Answer Question	6 with 2 'or' questions	6	6 × 5=30
Group C: Long Answer Question	2 with 1 'or' question	2	2 × 10=20
Total			60

References

1. Joshi, M. R. (1990), *Analytical Geometry*, Kathmandu: Sukunda Books Publications.
2. Sthapit,Y. R and Bajracharya, B. C. (2011), *Three-dimensional geometry*, Kathmandu: Sukunda Pustak Bhawan.
3. Narayan S. (2012)., *Analytical solid geometry*, New Delhi: S. Chanda and Company Pvt Ltd.
4. Koirala S. P., Pandey U. N. Pahari N. P., Analytic Geometry: Pragya Prakashan.

Far Western University
Faculty of Education
Mathematics Education

Course Title: History of Mathematics
Course Code: Maths.Ed.245
Level: Undergraduate
Semester: IV

Nature of Course: Theory
Credits: 3
Teaching Hours: 48
Time Per Period: 1 Hrs

1. Course Description

This course is designed for Undergraduate students to make students familiar with basic knowledge of historical development of Mathematics. It deals with the development of mathematics in the early, medieval, and modern era. The course is important for students majoring in mathematics because students need to know how different concepts in mathematics were developed. In addition, it develops curiosity towards the development of several concepts of mathematical content. It also provides the opportunity of comparing development of same content in different civilizations.

2. General Objectives

At the end of the course the students are expected to achieve the following objectives:

- To demonstrate understanding of how mathematics was developed by different civilizations.
- To sketch the development of mathematics in ancient, medieval, and modern periods.
- To explore the development of different branches of mathematics in different time periods.
- To appreciate the contribution of mathematicians in the development of mathematics.
- To realize that mathematical contents were not discovered at the same time, but they were developed in different civilizations and different time periods by different people.
- To engage in exploring historical development of mathematical contents.

3. Specific objectives and contents

Specific Objectives	Contents
• To explain ancient Babylonian mathematics: Arithmetic, Algebra and Geometry. • To explain ancient Egyptian mathematics: Arithmetic, Algebra and Geometry. • To compare Babylonian and Egyptian mathematics.	**Unit I: Babylonian and Egyptian Mathematics (5)** 1.1 Arithmetic in Babylon and Egypt 1.2 Algebra in Babylon and Egypt 1.3 Geometry in Babylon and Egypt
• To describe contributions of mathematicians of Greek in the development of mathematics. • To describe the content of Euclid's Element. • To briefly introduce three famous problems and explain efforts made by different mathematicians to solve the problems.	**Unit II: Greek Mathematics (8)** 2.1 Mathematicians before Euclid (Thales, Pythagoras and Pythagoreans, Zeno of Ela, Eudoxus) 2.2 Three famous problems (Duplication of cube, Trisection of angle, and quadrature of circle) 2.3 Euclid and his Element 2.4 Mathematicians after Euclid (Archimedes, Apollonius, Eratosthenes, Heron, Diophantus, Pappus, Ptolemy, Hyptia)

• To explain briefly contributions of hindu mathematicians (Aryabhata, Brahmgupta, Bhaskara, Ramanajun) • To describe mathematics included in Sulv Sutra and Siddhanta	**Unit III: The mathematics of Hindus (4)** 3.1 The earliest period (Sulvsutra, Jaina Mathematics and Siddhantha) 3.2 The Middle Period (Aryabhata, Brahmgupta, Bhaskara) 3.3 Modern Period (Shrinivasa Ramanajun)
• To describe how mathematics was developed in dark age and in the period of transmission. • To explain briefly mathematics of thirteenth, fourteenth and fifteenth century in Europe. • To describe contributions of Francois Viete in mathematics.	**Unit IV: Medieval European Mathematics (5)** 4.1 The dark age 4.2 The period of transmission 4.3 mathematics in thirteenth, fourteenth and fifteenth century 4.4 Francois Viete
• To describe contribution of Napier in development of logarithm • To describe contributions of Descartes and Fermat in development of Analytic geometry • To explain the contribution of Newton and Leibniz in development of calculus. • To describe how non- Euclidean geometry, projective geometry, projective geometry and topology were developed. • To describe contributions of well-known other mathematicians of modern era. • To compare the works of different mathematicians in the same content.	**Unit V: Mathematics of Seventeenth Century and After (21)** 5.1 Napier and his logarithms; Harroit and Oughtred; Galileo; Keepler; Desargues and Pascal. 5.2 Descartes and Fermat : Analytic Geometry 5.3 Cavalieri's method of indivisibles 5.4 Beginning of differentiation and integration. 5.5 Wallis; Barrow; Newton; Leibniz; Jakob Bernoulli & Johann Bernoulli; Taylor; Maclaurin; Lagrange; Laplace and Legendre 5.6 Gauss, Cauchy, Abel, Galois, Weirstrass and Riemann. 5.7 Erlanger program of Felix Klein 5.8 Cantor, Kronecker and Poincare. 5.9 Development of n- dimensional geometry, non-Euclidean geometry, Projective geometry and Topology.
• To describe mathematics developed in different time periods in Nepal. • To explore mathematics developed in different communities of Nepal	Unit VI: Development of Mathematics in Nepal (5) 6.1 Mathematics developed in different periods. 6.2 Mathematics developed in different communities

4. Methodology and Techniques

- Engage students (individually or GroupWise) to search about the contributions made by different mathematicians and let them present in a classroom. Then, discuss in a whole class.
- If the same content was developed by different mathematicians or by different civilizations, let the students to work in group and engage them in finding similarities and differences.
- Provide internet resources/link or reading materials to the students and engage them in self-study or study in group and then discuss on the whole class.
- For the last unit, let the search materials or articles from the internet. You may give project works for this chapter.
- Follow the constructivist approach in teaching content of the course.

5. Evaluation Scheme

5.1 **Internal Evaluation (40%)**

Internal Evaluation will be conducted by the course teacher based on following activities.

d) **Attendance and Participation in class activities**: 5+5= 10 marks

e) **Assignment I: Reflective Notes and Class presentation:** 5+5= 10 marks
(Reflective notes on 2 to 4 questions given by teacher at the end of the every unit and presentation on any two questions among them)

f) **Assignment II**: **one Term paper/ Essay/Project and Interview:** 5+5=10 marks
(Logical essay/term paper/project on the topics chosen by students and approved by the teacher and interview)

d) **Mid-term exam:** 10 marks

Description of the Internal Evaluation

Mid-term exam**: **Engagement in a Class: Marks will be assigned based on attendance and engagement in the classroom activities. At least 80% percent of class attendance is mandatory for the students to enable them to appear in the End-Term examination. Below 80% of attendees signify that signify is NOT QUALIFIED (NQ) in subject to attend the end term examination.

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***Term paper**:* It is individual work. It must be prepared by the use of a computer in a standard format of academic writing and must contain at least 5 pages. Quality, format, and time of submission will be the major criteria of the evaluation. The teacher will take interview of students based on their term paper.

Project Work: Students will be divided into groups. Each group will be assigned the project concerning application of concept and skills of selected topic of mathematics in ICT. Each group will present their findings to the whole class. Teachers may assign project work individually as well.

Mid-Term Examinations: It is a written examination, and the questions will be set covering the topics as taught in the sessions. Mid-term examination will be based on the model prescribed for End-term examination.

5.2 External Evaluation (60%)

External Examinations: It is also a written examination, and the questions will be asked covering all the topics in the session of the course. It carries 60 marks.

End Semester Examination Model

Nature of question	Total questions to be asked	Total questions to be answered	Total marks
Group A: Multiple choice	10 questions	10	10×1 = 10
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Group C: Long answer type question/case studies	2 with 1 'or' question	2	2×10 =20
Total			**60**

Recommended Books

Acharya, E. R. (2073 BS). Historical development of Mathematics. Sunlight Publication.
Burton, David M. (2007). The history of mathematics: an introduction (7th ed). McGraw-Hill.
Cooke, R. B. (1997). *The history of mathematics: a brief course.* John Willy and Sons Inc.

References

Eves, H. W. (1976). An introduction to the history of mathematics (5th ed.). CBS college publishing.