Mid-Western University

Faculty oF Education

Surkhet, Nepal

Master's of Education
M.Ed.
(2 Years Program)

MATHEMATICS EDUCATION

Curriculum 2015

Course Title: **Philosophical Foundations of Education**

Course: ED 511 Nature of course: Theory+Practical
Level: M.Ed. Credit Hours: 3
Semester: First Teaching Hours: 48

1. Course Introduction

This is the core and compulsory course designed to for the students who want to do master degree in science education. It aims to develop dynamic, competent and persistent people who have comprehensive theoretical knowledge in philosophy and sociology. It deals philosophy and its relationship with education. In the field of education philosophy is regarded as a foundation. This course also discusses about sociology and its relationship with education.

2. Course Objectives

The objectives of this course are as follows:

a) To elaborate the philosophical basses of education and it acquaint students about different philosophical schools.
b) To relate the sociological theory with education from the different perspectives.
c) To familiarize students with existentialism and its application of education in Nepal.
d) To familiarize students with different philosophy linking it with education.
e) To explain the origin, nature and educative process of Buddhism.
f) To elaborate the Islamic philosophy with its educational practice.
g) To describe the origin and nature of sociology and explain the relationship between educational sociology and sociology of education.
h) To elucidate the concept of social stratification with its basic characteristics and elements.
i) To enable students with in making comprehensive view about social transformation with types.
j) To analyze the influencing factors of education.
k) To describe the role of culture in education with different dimensions.

3. Course Contents

Unit One: Origin of Philosophy in the East and the West (10 hrs)

1.1 Fields of philosophy (Metaphysics, Epistemology Axiology and Logic) and their educational implication
1.2 Progressivism, reconstructions in terms of: aims, objectives, methods, role of teacher and students and curriculum

Unit Two: Existentialism and Education (5 hrs)

2.1 Philosophical premises
2.2 Objectives of education
2.2.1 Curriculum process
2.2.2 Students' and teachers' role
2.3 Application of this philosophy in Nepalese education

Unit Three: Different Philosophy and Education (15 hrs)

3.1. Hinduism and its ontology, epistemology and axiology
3.2. Six orthodox Hindu schools (Naya, Vaisheshika, samkhya, yoga, mimamsa, Vedanta)
3.3. Educational implication of Hinduism
3.4 Buddhism
- The first Jewel- Ontology of Buddhism
- The second Jewel- Epistemology of Buddhism
- The third Jewel- Axiology of Buddhism
- Philosophical premises of Buddhism
- Educational implication of Buddhism

3.5 Islamic and Christianity
- The five pillars of Islam
- Teaching of Islam
- Education and Islam (aims of education, curriculum and teaching process)
- Christianity as philosophy
- Origin of Christianity
- Metaphysics, epistemology and axiology of Christianity
- Teaching of Christianity
- Educative process of Christianity

Unit Four: The Origin of Sociology and its Development (5 hrs)

4.1 Origin of sociology and four founding fathers and their contributions.
4.2 Origin of educational sociology and sociology of education
4.3 Methods of studying sociology
4.4 Sociological theories: (Structural functionalism conflict and symbolic interactions)

Unit Five: Social Stratification (5hrs)

5.1 Concept of stratification and discrimination
5.2 Basic characteristics of stratification antiquity, ubiquity, the social patterning, amount and consequences, the diverging form
5.3 Perspective in stratification:
5.3.1 Max Weber and stratification

Unit Six: Social Transformation (8 hrs)

6.1 Concept (Change, mobility and transformation)

6.2 Theories related to social change
  6.2.1 Evolutionary, conflict and cyclic
6.3 Social mobility
  6.3.1 Vertical
  6.3.2 Horizontal
  6.3.3 Embourgeoisement
  6.3.4 Latent mobility
  6.3.5 Intergenerational and intergenerational mobility
6.4 Factors affecting mobility (Socio -economic status, intelligence, education)
6.5 Culture and education
  6.5.1 Concept function of culture
  6.5.2 Relationship between culture and education

4. Instructional Techniques

- Modes of instruction: Lecture, seminar, exercise course, guided personal study, tutorial, independent study, project work.
- Types of learning activities: Attending lectures, library consult performing specific assignments, writing paper, independent and private study, reading books, journals and papers, learning how to give constructive criticism, pee group study and discussion

5. Evaluation Schemes

- Internal: 40%
- External: 60%

Internal evaluation will be based on the following criteria:

- Attendance 5 marks
- Home assignment 10 marks
- Midterm exam 10 marks
- Project work/Class Presentation 10 marks
- Reflective Report 5 marks

External evaluation will be based on the following criteria:

Nature of questions	Total questions to be asked	Number of questions to be answered	Marks
Multiple choice items	10	1 Marks	10 Marks
Short answer questions	6 with 2 'or' questions	6x5 Marks	30 Marks
Long answer questions	2 with 1 'or' questions	2x10 Marks	20 Marks

6. Prescribed Texts

Abrahm, M.F. (2006). *Contemporary sociology: an introduction to concepts and theories.* New Delhi: Oxford University press (unit 5, 6 & 7)
Brannigan, M.C. (2000). *The pulse of wisdom* (2nded.). United State (for unit 3 & 4)
Michael, M. (2008). *Experiencing the world's religions tradition, challenge and change* (4thed.). New York: The Mc Graw- Hill companies (Unit 2&4).
Ozmon, H.A. & Craver, S.M. (1999). *Philosophical foundation of education* (6thed.). New Jersey USA: Prentice Hall ((Unit 1&2).
Giddens, A. (2005). Sociology (5thed).New Delhi: A.I.T.B.S. Publication(Unit 6&7)
Haralambos,M. (2003). Sociology themes and perspectives. New Delhi: Oxford University Press (Unit 6&7).
Mrunalini,T. (2008). Philosophical Foundations of Education. New Delhi: Neel Kamal Publications Pvt LTD.(Unit 1-4)

Course Title: **Education and Development**

Course: **ED 512** Nature of course: Theory+ Practical
Level: M.Ed. Credit Hours: 3
Semester: First Teaching Hours: 48

1. Course Introduction

This course is designed for those students who intend to have general knowledge about education and development. It aims is to help the students develop knowledge and skills which are necessary to formulate and implements the developmental issues of the nation. Students are encouraged throughout the course to consult with experts or specialists for their developing the insights about real meaning of education and development.

2. Course Objectives

The objectives of the course are as follows:

a) To enable the students in exploring the meaning of education and development.
b) To make the students familiar with principles of resource mobilization for development through the educational process.
c) To make the students in exploring the knowledge of globalization and social development.
d) To enable the students familiar with the relation of school and development.
e) To provide the students about the concept of different types of development theory.

3. Course Contents

Unit One: Meaning of Education and Development (5 hrs)

1.1. Individual
1.2. Society

Unit Two: Principles of Resource Mobilization for Development (8 hrs)

2.1. Access to education
2.2. Inclusion
2.3. Protection
2.4. Community participation
2.5. Cost effective and appropriate resourcing
2.6. Human resource development
2.7. Principles of vocational training

Unit Three: Globalization and Social Development (10 hrs)

3.1. Educational deficits and gaps
3.2. Progress coverage
3.3. Education, employment and income
3.4. Globalization and employment
3.5. Dynamics of the production and employment structure
3.6. Globalization and labor flexibility

Unit Four: School and Development (10 hrs)

4.1. The school as a learning organization: distant dreams
4.2. Recruitment and reaffirmation
4.3. Career and work rewards
4.4. The nature of profession
4.5. Collaboration and contrived collegiality
4.6. Teachers and their career story
4.7. Knowledge and teaching: Foundations of the new reform
4.8. School experiences and teacher socialization

Unit Five: Development Theory (10 hrs)

5.1. Dependency theory
5.2. Modes of production theory
5.3. World system theory
5.4. Neo liberalism
5.5. Modernism
5.6. Post modernism

Unit Six: The forms of Capital (5 hrs)

6.1. Cultural capital
6.2. Social capital
6.3. Conversions

4. Instructional Techniques

- Class discussion
- Presentation
- Group work/ practical work
- Project work
- Self study

5. Evaluation scheme

- Internal 40%
- External 60%

Internal Evaluation will be based on the following criteria:

- Attendance 5 marks
- Home assignment 10 marks
- Midterm exam 10 marks
- Project work/Class Presentation 10 marks
- Reflective Report 5 marks

External evaluation will be based on the following criteria:

Nature of questions	Total questions to be asked	Number of questions to be answered	Marks
Multiple choice items	10	1 Marks	10 Marks
Short answer questions	6 with 2 'or' questions	6x5 Marks	30 Marks
Long answer questions	2 with 1 'or' questions	2x10 Marks	20 Marks

6. Prescribed Texts

Education and development (2002).Module 3 (compendium of readings part one) unit 6 and 7

Christopher, C., Jeff, E. and Mathew, A. (2005). *Human resource management practices alignment and firm performance.* Ithaca, NY: Cornell University.

Course Title: **Foundations of Math Education**

Nature of course: Theoretical	Credit: 3 hrs
Level: M.Ed.	Teaching hours: 48
Course No: Math 513	Semester: First

1. Course description

Foundations of Mathematics Education is a specialized course which focuses on pedagogical content knowledge (PCK), Math-education content knowledge (MCK), and Technological content knowledge (TCK). This course will deepen the understanding of master's degree students by instilling knowledge as well as pedagogical skill.

2. General objectives

On the completion of this course, students will be able to:

1. Analyze critically the different views on the nature of mathematics
2. Examine, analyze and evaluate the various concepts, topics, methods and techniques related to curriculum design for School and undergraduate levels.
3. Comment critically the cultural diversity in mathematics education research.
4. Empower the students in their critical appraisal of at least four basal books written in mathematics education.
5. Sketch different trends that are observed in different conferences.
6. Prepare an analytical write-up related to the issues of mathematics education.

3. Specific objectives and contents

Contents	
Unit I: Philosophy of Mathematics	**(6)**
1.1 Introduction to Philosophy	
1.2 Different kinds of Mainstream Philosophy	
1.3 Philosophical enquiry in the classroom	
1.4 Nature and structure of mathematical knowledge	
1.5 Different views on fallibilist philosophy	
Unit II: Philosophy of Mathematics Education	**(7)**
2.1 Introduction to Mathematics Education	
2.2 Different foundations of Mathematics Education	
2.3 Shift in philosophy of Mathematics Education	
2.4 Different ideologies in Mathematics Education	
Unit III: Theories of Learning Mathematics	**(14)**
3.1 Broader classifications of learning theories	
3.2 Wheel of learning theories	
3.3 Basic questions raised in theories of learning mathematics	
3.4 Ausubel's learning theories and its implications.	
3.5 Diene's learning theories and its Implications.	
3.6 Piaget's learning theories and its Implications.	
3.7 Gagne's learning theories and its Implications	
3.8 Bruner's learning theories and its Implications	
3.9 Skemp's learning theories and its Implications	
3.10 Vygotsky's earning theories and its Implications	
3.11 Different psychologies and their stands on Basic questions.	
3.12 Comparison among different learning theories	

Unit IV: Instructional Strategies	**(8)**
4.1 Introduction to Instruction Strategies	
4.2 Different models of Instructional Strategies	
4.2.1 Expository model	
4.2.2 Problem Solving model	
4.2.3 Individualized Model	
4.3 Improving Instruction Using Constructivist Pedagogy	
4.4 Teaching strategies in socially culturally diverse situation	
Unit V: Instructional Media and Technology	**(7)**
5.1 Introduction	
5.2 Comparing and contrasting between Media and Technology	
5.2.1 Media and Material	
5.2.2 Vidual, Audio, Video, computers and Multi-media	
5.2.3 Internet and Intranets	
Unit VI: Issues in mathematics teaching	**(6)**
6.1 Introduction: raising the issues	
6.2 Social context of Mathematics Education	
6.3 Personal spiritual, moral, social and cultural issues	
6.4 Critical mathematics education	

Note: *The figure in the parenthesis indicates the appropriate teaching hours for the respective units and contents.*

Instructional Approaches

4.1 General Instructional Techniques
- 4.1.1 Lecture
- 4.1.2 Discussion
- 4.1.3 Presentations

4.2 Specific Instructional Techniques

Unit	Examples of Instructional Techniques
I + II	Presentation, Guest Lecture
III + IV	Document Review, Individual presentation
V + VI	Project Work, Brain Storming

5. Evaluation

***5.1 Internal Evaluation* 40%**

The internal evaluation will be conducted by the course teacher based on following activities.

1. Attendance	5 points
2. Participation in learning activities	5 points
3. First assignment / midterm exam	10 points
4. Second assignment / assessment	10 points
5. Third assignment/assessment	10 points
Total	40 points

5.2 ***External Evaluation (Final Examination)*** **60%**

Examination Division of the Dean office, Faculty of Education will conduct final examination at the end of the semester. The types and number of questions to be included in the final paper are as follows.

1. Objective questions (multiple choice 10 × 1)	10 points
2. Short answer questions (6 questions × 5 points)	30 points
3. Long answer questions (2 questions ´ 10 points)	20 points
Total	60 points

6. References

Bell, H. F. (1978). *Teaching and learning mathematics.* WMC Brown Company Publisher. (Unit—IV)

Gates, P. (2003). Issues in mathematics teaching. (Ed.) London: Routledge Flader. (Unit –VI)

Heinich, R. et. Al. (2002). *Instructional media and technology* (7th ed). New Jersey: Merrill Prentice Hall. (Unit V)

Hersh, R. (1997). *What is mathematics, really?* Oxford, UK: Oxford University Press. (Unit I & II)

Skemp, R. (1982). *The psychology of learning mathematics*. Hormonds worth, England: Penguin Books. (Unit III)

Vygotsky, L. S. (1986). *Thought and language.* (Ed.). England: The MIT Press. (Unit III)

Course Title: **Mathematical Statistics**

Nature of course: Theory	Credit: 3 hrs
Level: M.Ed.	Teaching hours: 48
Course No: Math 514	Semester: First

1. Course description

Human beings create an immense and ever-increasing volume of data. Meaning making and understanding of the values of data is possible only through statistical methods. This course equips the student with the skills required for developing and implementing these methods in combination of deep mathematical well grounded method. This course provides the students with sampling theory, estimation, confidence interval and hypothesis testing (parametric and non-parametric).

2. General Objectives

Upon completion of this course the mathematics teacher-educators will be able to:

1. Explain the various methods of sampling techniques
2. Explain multivariate, discrete and continuous probability distributions.
3. Find the moments of linear combination of random variables and prove Central-Limit Theorem.
4. Describe the meaning and types of sampling distributions from normal population and apply them.
5. Define, describe the importance of point estimation and interval estimation and apply them to solve problems.
6. Distinguish between parametric and non-parametric tests of hypothesis and carryout tests of hypotheses.
7. Describe the importance of ANOVA and ANCOVA and apply them to solve problems.
8. Explain the concepts of partial and multiple correlation and regression and apply them to solve problems.

3. Specific Objectives and Contents

Unit	Contents
I	**Sampling Techniques** **4 Periods** Design of Sample Survey: Population and Sample, Sampling Units, Sampling frame Principles of Sampling Theory, Census, Sample Survey and Questionnaires, Estimation of Sample Size
II	**Probability Distributions** **6 Periods** Joint Probability Distribution, Marginal Probability Distributions, Conditional Probability Distributions, Independent Random Variables, Covariance, Mean and Variance of Linear Combinations of Random Variables, Conditional Expectation and Variance, Moments and Moment Generating Function and its Properties, Product Moment, Moment Generating Function of Product of n random variables.
III	**Discrete and Continuous Probability Distributions** **10 Periods** Binomial Distribution: mean and variance, recursion; Hyper-geometric Distribution: mean, variance, recursion, Poisson Distribution: mean, variance, Recursion, Gamma, Beta and Exponential and Chi-square Distributions: Mean and variance; Normal Distribution: mean and variance; Normal Approximation of Binomial distribution and its derivation, Moments Generating Functions of Respective Distributions

Unit	Contents
IV	**Sampling Distributions** **4 Periods** Sampling Distribution of Mean, Central Limit Theorem and its Derivation, Sampling Distribution of Difference of Mean, proportion, difference of proportion, variance, ratio of variance t- and F – Distributions; Use of respective tables and Application
V	**Estimation of Parameters and Hypothesis testing** **14 Periods** Types and properties of Estimators; Confidence Interval; Estimation and Hypothesis Testing (Means, Difference between Means, Proportion, Difference between Proportion, Variance, Ratio of Two Variances, Correlation Coefficient and Regression Coefficients) Chi-square test for Goodness of Fit, test for independence; One-way and two way Analysis of Variance/co-variance; SPSS (use in related test)
VI	**Non- Parametric Tests** **6 Periods** Difference between parametric and non-parametric tests. Types of Non-Parametric Tests: Sign test, U-Test,H-test, Friedman Test, Run Test, Related theorems and Testing Hypotheses Using the above Tests
VII	**Partial and Multiple Correlation and Regression** **5 Periods** Multiple Linear Regression and Equation to Regression Plane; Multiple Correlation and Partial Correlation., Relation between Multiple and Partial Correlation and Interpretation of Multiple Regression and correlation.

4. Instructional Techniques

4.1 General Techniques: Lecture, Discussion, Question-Answer

4.2 Specific Instructional Techniques

Unit	Activity and Instructional Techniques
Unit 1	Group and individual Presentation, Students' participation in discussion
Unit 2	Group and individual Presentation, Students' participation in discussion
Unit III	Group and individual Presentation, Students' participation in discussion
Unit IV	Group and individual Presentation, Students' participation in discussion
Unit V	Group and individual Presentation, Students' participation in discussion
Unit VI	Group and individual Presentation, Students' participation in discussion
Unit VII	Group and individual Presentation, Students' participation in discussion

5 Evaluation

5.1 Internal Evaluation 40%

Internal evaluation will be conducted by course teacher based on following activities

1)	Attendance	5 Point
2)	Participation in learning activities	5 Points
3)	First assignment/ midterm exam	10 Points
4)	Second assignment/assessment	10 Points
5)	Third assignment/ assessment	10 points
	Total	40 Points

5.2 External Examination (Final examination) 60%

Examination Division of the Dean office, Faculty of Education will conduct final examination at the end of the semester

1.	Objective questions	(multiple choice 10 × 1)	10 points
2.	Short answer question	(6 question × 5 points)	30 points
3.	Long answer questions	(2 questions × 10 points)	20 points
	Total		60 points

Recommended book and Reading materials:

Freund, J. E. (2012): *Mathematical Statistics*, New Delhi: Prentice Hall of India.

Freund, J. E. (2012): *Modern elementary Statistics (5th ed.)*. New Delhi: Prentice Hall of India.

Upadhyay, H. P. & Dhakal, B. P. (2069). *Mathematical statistics.* Kathmandu: Sunlight Publication

References:

Garret, H. E. and Woodworth, R. S. (2000): *Statistics in Psychology and Education*. New York: Longman, Green and Co. Inc.

Haslett, H. T (1983): Statistics Made Simple, Heinemann: London

Mendenhall, W, Schaeffer, R. L. and Wackerly, D. D. (1987): Mathematical Statistics with Applications. Boston: PWS Publishers.

Spiegel, M. R. (2000). Theory and problems of probability and statistics. Singapore: Schaum's Outline series, Mc/graws-Hill International Book company.

Wallpole, R. (1979): Introduction to Statistics, Delhi: Macmillan India

Course Title: **Abstract Algebra**

Nature of course: Theoretical	Credit: 3 hrs
Level: M.Ed.	Teaching hours: 48
Course No: Math Ed 515	Semester: First

1. Course description

This course is designed for the students specializing Mathematics Education at Masters in Education (M.Ed.). The course deals with abstract algebra covering axiomatic structures such as group theory including Sylow Theorems , classification of finite groups, and solvable and nilpotent groups and series of groups. Further the course covers the ring theory and field theory. This course can be implemented with different instructional strategies and different assessment techniques.

2. General objectives

The general objectives of this course are as follows:

- To assist students for deeper understanding of theoretical concepts of abstract algebra.
- To develop students' capabilities in solving theoretical problems.
- To develop students' positive attitude towards abstract algebra.

3. Specific objectives and contents

Contents
Unit I: Group Theory (10)
1.1 Review of groups, subgroups, normal subgroups, quotient groups, and cyclic groups, permutation groups, alternating groups, homomorphism and automorphism of groups.
1.2 Direct product and direct sum of groups
1.3 Free abelian groups.
1.4 Finitely generated free abelian groups
Unit II: Group Actions, Sylow Theorems and Classification of Finite Groups (6)
2.1 Group acting on sets.
2.2 The class equations.
2.2 The Sylow Theorems and P-groups.
2.3 The classification of finite groups of small orders (1- 15).
Unit III: Nilpotent and Solvable Groups and Series of Groups (6)
3.1 Normal and subnormal series of groups.
3.2 Ascending central series and derived series of groups.
3.3 Nilpotent and solvable groups. (Including Zassenhaus's lemma, Jordan-Holder Theorem and Schreier's Theorem).
Unit IV: Ring Theory (12)
4.1 Review of ring, sub-rings, ideals and their operation, factor ring and ring, homomorphism, integral domain, principal ideal domain, unique factorization domain and Euclidean domain.
4.2 Ring of polynomials and formal power series.
4.3 Factorization in polynomial rings.
Unit V: Field Theory (14)
5.1 Field extensions.
5.2 Splitting fields, algebraic closure and normality.
5.3 Separable and inseparable extensions
5.4 Fundamental theorem of Galois theory.
5.5 Galois group of polynomials.
5.6 Finite fields.

Note: *The figure in the parenthesis indicates the appropriate teaching hours for the respective units and contents.*

4. Instructional Techniques : This course is theoretical in nature and thus the teacher-centered instructional techniques will be dominant in teaching learning process. However, the instructional technique for this course is divided into two groups. The first group consists of general instructional techniques applicable to most of the contents. The second group consists of the specific instructional techniques applicable to specific contents of each chapter.

4.1 ***General Techniques:*** Following instructional techniques will be adopted according to the need and nature of the lesson.

- Lecture and Discussion
- Question-answer
- Explanation and illustration
- Group work presentation and participation
- Self-study

4.2 ***Specific Instructional Techniques***

Unit	Activity and instructional techniques
I	• Group discussion for constructing new groups from given groups. • Individual work and group work presentation on classifying finite abelian groups. • Individual assignment on solving problem related to free abelian groups. • Problem solving exercise.
II	• Individual work and Group work to apply group action in proving theorems. • Individual work and group work Presentation to explore the relation of Sylow's theorems. • Individual assignment to find the Sylow's p-subgroups and p-subgroups of the finite groups. • Group work presentation on classifying finite groups of small order. • Group work assignment on solving some problem of exercise and then group presentation.
III	• Individual work and group work to explore some solvable and nilpotent groups. • Individual assignment to find the series stated in this unit and presentation. • Group tasks to solve the problem of exercise and discussion in small groups.

Unit	Activity and instructional techniques
IV	• Inquiry and question answer • Individual work and group work Presentation • Paper presentation • Problem solving exercise
V	• Individual work and group work Presentation • Solving problem of exercise • Connecting examples with theorems and finding related examples.

5. Evaluation: The learning / achievement of the students will be evaluated during the semester by department of mathematics education, Dean Office, Faculty of Education, Mid-Western University. So, following two types of evaluation will be conducted to evaluate the student's progress.

5.1 *Internal Evaluation* 40%

The internal evaluation will be conducted by the course teacher based on following activities.

1. Attendance	5 points
2. Participation in learning activities	5 points
3. First assignment / midterm exam	10 points
4. Second assignment / assessment	10 points
5. Third assignment/assessment	10 points
Total	40 points

5.2 *External Evaluation (Final Examination)* 60%

Examination Division of the Dean office, Faculty of Education will conduct final examination at the end of the semester. The types and number of questions to be included in the final paper are as follows.

1. Objective questions (multiple choice 10 × 1)	10 points
2. Short answer questions (6 questions × 5 points)	30 points
3. Long answer questions (2 questions ´ 10 points)	20 points
Total	60 points

2. Recommended and Reference Books

Recommended Books

Bhattacharya, P. B, et.al. (2007*). Basic abstract algebra*, (Printed in india): Cambridge University Press.

Dummit D.S. and Foote, R.M. (2008). *Abstract algebra*, India: Wiley East House.

Hungerford, T.W. (1974). *Algebra*. New YorK: New York Inc.Springer Verlag.

Reference Books

Bhattarai, B. N. (2011). *Introduction of group theory*. Kathmandu: Subhakamana Prakashan.

Bhattarai, B.N. (2011). *Introduction of rings and modules.* Kathmandu: Subhakamana Prakashan.

Cohn, P. M. (1977).*Algebra Vol I and II*. New York: John Wiley.

Fraleigh, J. B. (1984*). A first course in abstract algebra*. New Delhi: Narosa Publishing House.

Gopal, K. N. S. (1986). *University algebra.* India: Wiley Eastern Limited.

Herstein, I. N. (2006). *Topic in algebra*. India: John Wiley and Sons.

Maharjan ,H. B. (2007*). Group theory*. Kathmandu: Bhudipuran Prakasan.

Maharjan, H. B. (2008). *Rings and modules.* Kathmandu: Bhudipuran Prakasan.

Course Title: **Differential Geometry**

Nature of course: Theoretical	Credit: 3 hrs
Level: M.Ed.	Teaching hours: 48
Course No: Math Ed 516	Semester: First

1. Course description

This course is an introduction to differential geometry designed for Master programme at MWU. This course is about the calculus used intensity of curves and surfaces using in three dimensional space. This course broadly captures curves on surfaces, first and second fundamental form, normal curvature, Gaussian and mean curvature, and minimal surfaces etc.

2. General objectives

The aim of the course is to provide students with an understanding of curves and surface and their properties in three dimensional space.

On successful completion of the course the students should be able to:

- understand the concept of a space curve
- calculate the connection and curvature and torsion of space curve
- understand and calculate fundamental forms of surface
- understand analyze the intrinsic and extrinsic properties of surface

3. Specific objectives and contents

Contents		
Unit 1:	**Curves in Space**	**(12)**
1.1	Explicit and implicit representation of space curve	
1.2	Osculating plane	
1.3	Curvature, torsion and screw curvature	
1.4	Cylindrical helix	
1.5	Fundamental theorem for space curve	
1.6	Osculating circle and osculating sphere	
1.7	Evolutes and involutes	
1.8	Bertrand curves and their properties	
Unit II:	**Surface, Envelopes, Developable and Ruled Surface**	**(10)**
2.1	Implicit and explicit representation of surface	
2.2	Transformation and its geometric significance	
2.3	Tangent plane and normal to the surface	
2.4	Family of surface	
2.5	The ruled surface	
2.6	Developable surface	
2.7	Developable associated with space curves	
Unit III:	**Fundamental forms of the Surface**	**(6)**
3.1	First fundamental form of surface	
3.2	Second fundamental form	
3.3	Weingarten equations	
3.4	Differential equation of family of curves	
3.5	Double family of curves	

Unit IV:	**Local non-intrinsic properties of surface**	**(10)**
4.1	Local non-intrinsic property of surface	
4.2	Normal curvature and its properties	
4.3	Meusnier's theorem	
4.4	Line of curvature and its properties	
4.5	Euler's theorem	
Unit V:	**Conjugate directions, asymptotic lines fundamental equations of surface theory and parallel surfaces**	**(10)**
5.1	Conjugate direction and its properties	
5.2	Asymptotic lines and related theorems	
5.3	The fundamental equation of surface theory	
5.4	Parallel surface and related theorems	
5.5	Bonnet's theorem on parallel surface	

Note: *The figure in the parenthesis indicates the appropriate teaching hours for the respective units and contents.*

Instructional Techniques

The instructor will select the method or methods of instruction most suitable for a particular topic. It is quite acceptable to select more than one method and combine them into a single period of instruction if the subject demands it. For example, an instructor could combine a Structured Lesson method to impart theory and follow it up with Demonstration in order to enforce understanding.

Evaluation

Internal Evaluation 40%

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

1) Attendance	5 points
2) Participation in learning activities	10 points
3) Assignments	10 points
4) Project works	15 points
Total	40 points

External Evaluation (Final Examination) %

Examination Section, Office of the Dean, will conduct final examination at the end of the semester as follows:

Objective Type Question 1 mark × 10	=	10 points
1) Short Answer Question 5 marks x 6	=	30 points
2) Long Answer Question 10marks x 2	=	20 points
Total	=	60 points

Recommended Books

1. Koirala S. P, & Dhakal B. P. (2068) *Differential Geometry*. Sunlight Publication, Kirtipur, Nepal
2. Gupta, P. P., Mallik, G. S & Pundir, S. K., (2011). *Differential geometry*. Meerut: Meerut Pragati Prakashan.

Refrence Books

3. Carmo, M. P. (1976) *Differential Geometry of Curves and Surfaces*. Englewood Cliffs, NJ: Prentice-Hall
4. Lal, B., (1969). *The three dimensional differential geometry*. Delhi: Atma Ram and Sons.
5. Wilmore, T. J., (2006). *An introduction to differential geometry*. Delhi: Oxford University Press.
6. Lipschutz, M.M., (2005). *Theory and problems of differential geometry- Schuam's outline series*. Delhi: Tata McGraw-Hill Publishing Company Ltd.

Vygotsky, L. S. (1986). *Thought and language.* (Ed.). England: The MIT Press. (Unit III)

Course Title: **Managing Diversity in Education**

Course: **ED 521** Nature of course: Theory+Practical
Level: M.Ed. Credit Hours: 3
Semester: Second Teaching Hours: 48

1. Course Introduction

This course is designed to help students understand the meaning and perspectives of diversity management. The course acquaints the students with the diversity management performance, practices and factors that are affected by multicultural perspectives. It also deals with diversity technology, sources and managing for diversity to disadvantaged group of peoples.

2. Course Objectives

The objectives of this course are as follows:

a) To make meaning of diversity management from different perspectives
b) To provide a deeper knowledge on multiculturalism for managing diversity.
c) To make the students familiar with the different factors and causes of diversity management.
d) To identify the different ways of diversified sources for managing diversity.
e) To develop the concept and ways for measure the education strategies for disadvantaged groups.
f) To provide a better understanding about the challenges for managing diversity.
g) To provide the knowledge of constraints of diversity management.

3. Course Contents

Unit One: Diversity Management (13 hrs)

1.1 Meaning and concept of diversity management
- International perspective
- Population dynamics as a driver of diversity management

1.2 Diversity management from a student perspective
1.3 Diversity management from a personnel perspective
1.4 Diversity management from an institutional management perspective
- Diversity management linked to the strategic plan
- Main thrusts of the strategic plan
- The role of management information in institutional diversity management
- Levels of management information

Unit Two: Multiculturalism (13 hrs)

2.1 Concept

2.2 Model of structural change (Total quality diversity)
2.3 A holistic model of total quality diversity
2.4 The process of change
- Contemporary challenges of ethnic diversity
- Diversity: challenges for national policy makers and planners
- Models for incorporating diversity
- Need to revisit policy responses to diversity

Unit Three: Factors for Managing Diversity (5 hrs)

3.1 Diversity management plan
3.2 Objectives
3.3 Role of leadership
3.4 Initial approach
3.5 Strategy and links to key planning
3.6 Goals and measures

Unit Four: Diversified Sources (5 hrs)

4.1 Changing patterns
4.2 Privatization
- Different modes of privatization
- The strategies for privatization
- Arguments of privatization

Unit Five: Education Strategies for Disadvantaged Groups(5 hrs)

5.1 Definition of disadvantaged group
5.2 Motivation
5.3 Work opportunities
5.4 Challenges
5.5 Government and aid agencies

Unit Six: Challenges and constraints of Diversity management (7 hrs)

6.1 Resistance
- Poor communication
- Disorganization

6.2 Context matter
6.3 Organization structure
6.4 Legitimacy of government and policy change
6.5 Social structure and beliefs system
6.6 Federation issues

4. Instructional Techniques

- Modes of instruction: Lecture, seminar, exercise course, guided personal study, tutorial, independent study, project work,
- Types of learning activities: Attending lectures, library consult performing specific assignments, writing papers, independent and private study, reading books, journals and papers, learning how to give constructive criticism, pee group study and discussion

5. Evaluation Scheme

- Internal:40%
- External:60%

Internal evaluation will be based on the following criteria:

- Attendance 5 marks
- Home assignment 10 marks
- Midterm exam 10 marks
- Project work/Class Presentation 10 marks
- Reflective Report 5 marks

External evaluation will be based on the following criteria:

Nature of questions	Total questions to be asked	Number of questions to be answered	Marks
Multiple choice items	10	1 Marks	10 Marks
Short answer questions	6 with 2 'or' questions	6x5 Marks	30 Marks
Long answer questions	2 with 1 'or' questions	2x10 Marks	20 Marks

6. Prescribed Texts

Pieter, J. V. (2011). *Diversity Management in Higher Education: A South African Perspective in Comparison to a homogeneous and monomorphous society.* Germany: Centre for Higher Education Development.

_____(2004).Comprehensive *diversity management plan.* Washington DC: US nuclear regulatory commission.

Caleb, R. (2006). *What do we mean by diversity management?* New Haven: Southern Connecticut State University.

Course Title: **Application of Learning Theories in Education**

Course: **ED 522** Nature of course: Theory+Practical

Level: M.Ed. Credit Hours: 3

Semester: Second Teaching Hours: 48

1. Course Introduction

This course is a core course for the students studying Master Degree in Educational Science. This deals with psychology of learning and application of learning theory in classroom teaching. It includes the learning theories and paradigms ranging from the behaviouristic theories to cognitive theories. As the implementation of these theories for teaching and professional development, this course enables the student in drawing upon these theories in their everyday teaching and professional practices.

2. Course Objectives

On completion of this course the students will be able:

a) To explain cognitivism, behaviorism and constructivism as a broader family of learning theory
b) To develop understanding of Pavlovian conditioning
c) To discuss various types of conditioning
d) To familiarize students with meaning and concept of operant conditioning
e) To make students able to explain the acquisition process of operant conditioning
f) To give the concept of reinforcement and its application to change behaviors of learners
g) To use the operant conditioning in classroom teaching and learning
h) To clarify the concept of phi-phenomenon in productive thinking and its implication for teaching and learning
i) To list the principles of perception with explanation
j) To enable students to explain purposive behavior
k) To discuss Tolman's experiments and draw the conclusion from them
l) To enable to analyze the premises of individual constructivism
m) To make the meaning of basic features of individual constructivism
n) To draw a educational implication of individual constructivism
o) To define the social constructivism and its premise

3. Course Contents

Unit One: Philosophical Orientation to Learning Theories (10 hrs)

1.1. Origin of learning theories
1.2. Major learning theories
1.2.1. Behaviorism and its basic characteristics
1.2.2. Cognitivism and its basic characteristics
1.2.3. Constructivism and its basic characteristics

Unit Two: Principles of Pavlovian conditioning and Implication (8 hrs)

2.1 Acquisition of the conditioned response
- Measures of conditioning
- Conditioning paradigms

2.2 Nature of extinction and its paradigm
2.3 Other inhibitory processes
2.4 Conditioning
- Higher-order conditioning
- Sensory preconditioning
- Vicarious conditioning

2.5 Application of Pavlovian conditioning in teaching

Unit Three: Operant Conditioning (10 hrs)

3.1. Meaning and concept
3.2. Acquisition of operant behavior (CR) (Principle and Mechanism)
3.3. Shaping and its principle
3.3. Meaning, concept and schedule of reinforcement
3.5. Application of Reinforcement
3.4. Implication for teaching and learning

Unit Four: Wertheimer Productive Thinking (10 hrs)

4.1. Concept of phi-phenomenon
4.2. Concept and principle of perception
4.3. Implication for teaching and learning

Unit five: Tolman's Purposive Behaviorism (10 hrs)

5.1. Concept of purposive behaviorism
5.2. Theory of purposive behaviorism (Expectancy, Place and Insight learning)
5.3. Drawing conclusions for educational implication

Unit Six: Constructivism (10 hrs)

6.1. Meaning and concept
6.2. Paiget's constructivism (Psychological/Individual constructivism)
6.3. Basic premises of Paiget's Constructivism (Implicit Theories and Knowledge construction process)
6.4. Basic features (Scheme, Adaptation-Assimilation and Accommodation, Equilibration)

6.5. Implication for teaching and learning
6.6. Vygotsky's constructivism (Social constructivism)
6.7. Basic premises of social constructivism (Situated cognition and Knowledge construction process

4. Instructional Techniques

- Modes of instruction: Lecture, seminar, exercise course, guided personal study, tutorial, independent study, project work,
- Types of learning activities: Attending lectures, library consult performing specific assignments, writing papers, independent and private study, reading books, journals and papers, learning how to give constructive criticism, pee group study and discussion

5. Evaluation Scheme

- Internal 40%
- External 60%

Internal Evaluation is based on the following criteria

- Attendance 5 marks
- Home assignment 10 marks
- Midterm exam 10 marks
- Project work/Class Presentation 10 marks
- Reflective Report 5 marks

External evaluation will be based on the following criteria:

Nature of questions	Total questions to be asked	Number of questions to be answered	Marks
Multiple choice items	10	1 Marks	10 Marks
Short answer questions	6 with 2 'or' questions	6x5 Marks	30 Marks
Long answer questions	2 with 1 'or' questions	2x10 Marks	20 Marks

6. Prescribed Texts

Hill, W.F. (1973) *Learning: A survey of psychological interpretation.* London: Lowe & Brydone. (Unit I to VII)
Hildgard, E.R., & Bower, H.G. (1975). *Theories of Learning.* Delhi: Prentice Hall. (Unit I to VII)
Hurlock, E.B. (2002). *Developmental psychology: A life-span approach.* New Delhi: Tata McGraw Hill.
Klein, S.B. (1996). *Learning: Principle and application.* McGraw Hill. Inc. (Unit I to VII)
Schunk, H.D. (1996). Learning theories. Englewood Cliffs, NJ: Prentice Hall. (Unit I to VII)
Woolfolk, A. (2008). *Educational Psychology.* New Delhi: Pearson Education. (Unit I to VII)

Course Title: **Research Methods in Education**

Course: **ED 523** Nature of course: Theory +Practical
Level: M.Ed. Credit Hours: 3
Semester: Second Teaching Hours: 48

1. Course Introduction

This course is designed to acquaint the students with the basic understanding of research skills with a particular relevance to studying and understanding of the educational issues and problems. It provides them both with both theoretical knowledge and practical skills in carrying out the independent research work by developing research proposal in a standard APA format.

2. Course Objectives

On completion of this course the students will be able to

a) Discuss the basic concept and meaning of research and educational research
b) Explain the nature and purpose of educational research
c) Identify various research types with their characteristics.
d) Classify sampling techniques and explain each with examples.
e) Identify various sampling techniques and choose appropriate one for own research project.
f) Describe the procedures of carrying out different research designs.
g) Identify various data collection tools and discuss advantages and disadvantages.
h) Describe and use general procedure followed in the analysis of qualitative and quantitative data.
i) Describe the components of a research proposal and report.
j) Write a research proposal and report.
k) State some of the criteria to use in evaluating a research report.

3. Course Contents

Unit One: Concept of Research (10)

1.1. Meaning and definition of research and educational research
1.2. Nature and its purposes in educational research
1.3. Scope of educational research
1.4. Research problems
1.5. Objectives of educational research
1.6. Hypothesis
1.7. :Review of literature Theoretical, Empirical and conceptual / theoretical framework

Unit Two: Research Designs (5)

2.1. Quantitative, qualitative and mixed research design
2.2. Basic, applied and action research
2.3. Experimental research design study
2.4. Survey
2.5. Case study
2.6. Historical research
2.7. Ethnography

Unit Three: Sampling (10)

3.1. Introduction
3.2. Probability sampling
- Simple random sampling
- Stratified random sampling
- Cluster sampling

3.3 Non-probability sampling
- Purposive sampling
- Quota sampling
- Convenience sampling
- Snowball sampling

3.4 Sample size and error

Unit Four: Tools of Data Collection (5)

4.1. Interview
4.2. schedule
4.3. Questionnaire
4.4. Observation
4.5. Rating scales : Thurnstone's and likert's scales
4.6. Tests
4.7. Focus group discussions

Unit Five: Analyzing the Data (12)

5.1. Analyzing quantitative data
- Data editing and tabulation

5.2. Statistical analysis
- Measure of central tendency
- Measure of dispersion
- Measure of correlation coefficient (Pearson's and Spearman's method)
- Hypothesis testing

5.3. Analyzing qualitative data
- Organizing and coding
- Comparing and Exploring relationships and patterns
- Final themes and interpretation

Unit Six: Research Proposal and Report **(6)**

6.1 Need of writing research proposal
6.2 Components of research proposal
6.3 Development of a research proposal
6.4 Requirements for writing research report
6.5 Essential components of a research report
6.6 Use of APA format in research report
6.7 Evaluation of research report

4. Instructional Techniques

- Lecture, seminar, exercise course, guided personal study, tutorial, independent study, project work
- Types of learning activities: attending lectures, performing specific assignments, writing papers, independent and private study, reading books, journals and papers, learning how to give constructive criticism, peer group study and discussion

5. Evaluation Scheme

1.1 Internal 40%
1.2 External 60%

Internal evaluation will be based on the following criteria

- Attendance 5 marks
- Home assignment 10 marks
- Midterm exam 10 marks
- Project work/Class Presentation 10 marks
- Reflective Report 5 marks

External evaluation will be based on the following criteria:

Nature of questions	Total questions to be asked	Number of questions to be answered	Marks
Multiple choice items	10	1 Marks	10 Marks
Short answer questions	6 with 2 'or' questions	6x5 Marks	30 Marks
Long answer questions	2 with 1 'or' questions	2x10 Marks	20 Marks

6. Prescribed Texts

Ary, D., Jacobs, L.C., Sorensen, C. and Razaveih, A. (2009). *Introduction to research in education.* (8th ed). Belmont, CA: Wadsworth/Thomson Learning (Unit I to VII)
Best, J.W. and Kahn (2006). *Research in education* (10th ed.), New Delhi: Prentice Hall of India (Unit I to VII)
Creswell, J. and Plano, V.L. (2011). *Designing and conducting mixed methods research* (2nd ed.). Thousand Oaks, CA: Sage (Unit I to VII)
Cohen, L., Manion, L. and Morrison, Keith (2007). *Research methods in education* (6th ed.) London: Routledge (Unit I to VII).
McMillan, J.H. (2000). *Educational research: fundamentals for the consumer* (3rd ed.). New York, NY: Addison, Wesley and Longman (Unit I to VII).
Punch, K.F. (2009). *Introduction to research methods in education.* London: Sage (Unit I to VII)
Wiersma, W. (2000). *Research methods in education: an introduction* (7th ed.) Boston: Allyn and Backon (Unit I to VII)

Course Title: **History of Mathematics**

Nature of course: Theory | Credit: 3 hrs

Level: Master's Degree in Math Education | Teaching hours: 48

Course No: Math Ed 524 | Semester: II

1. Course Description

History of Mathematics is primarily a subject of an investigation about its context how mathematical objects, its notations and methods were discovered in the history. Mathematics begins with the anecdote in different papyrus, in different archives and in different temples/artifacts found in different civilizations. In different periods (from antiquity through medieval to modern) mathematicians created different branches of mathematics while they tried to answer/solve antiquity problem/puzzles/paradoxes. This course gives a comprehensive overview of ubiquitous nature of pure (Math for its own sake), applied (traditional) and applicable mathematics (new application). It is important for students, teachers as well as trainers along with the researchers.

2. General Objectives of the course

The general objectives of this course are as follows:

- Familiarize the students with the origin and Development of numbers and numerals in different civilizations.
- Enable students to sketch major mathematics achievement during Hellenistic period.
- Have students derive major activities during Renaissance period.
- Let the students justify how mathematics has developed over the centuries.
- Empower the students in dressing the development of modern mathematics from middle ages to the calculus and other discoveries to recent numbers theory.
- Enable the students to draw tree of mathematics and establish linkage between different areas: pure, applied and applicable mathematics.

3. Course Outlines

Specific Objectives	**Contents**	**Hrs (48)**
1. Describe the Mathematics of Antiquity (Pre-historic Period) 2. Sketch the timeline of different civilizations and major contribution made during that periods. 3. Describe the work of different iconoclast philosophers who shaped mathematics in different fields. 4. Compare and contrast between the numeral and number systems of different civilizations. 5. Explain Ancient Egyptian Mathematics specifically, arithmetic, geometry, pure and practical. 6. Explain Babylonian mathematics: arithmetic, geometry, astronomy. 7. Explain the development of Greek mathematics.	**Unit-I: Mathematics in different civilization** 1.1 Egyptian (Numerology) 1.2 Mesopotamia (No. system base 60) 1.3 Greek (Axiomatic Geometry) 1.4 Roman (Diophantus, Pappus, Hypatia) 1.5 Hindu (Sulvasutra, Jain Math, Siddhantas, Aryabhat, Brahmagupta) 1.6 Chinese (the nine chapters, Magic Squares) 1.7 Islamic (Al-khwarizmi, Omar Khayyam)	**8**

Specific Objectives	Contents	Hrs (48)
1. Describe the contribution of early Greek philosophers in geometry. 2. Give critical appraisal of Zeno's paradoxes. 3. Describe the beauty of axiomatic system developed by Euclid. 4. Argue about the work of Archimedes and Apollonius in the development of mathematics. 5. Describe the characteristic products of Greek mathematics during Hellenistic period.	**Unit-II: The Early Greeks** 2.1 Early Philosophers (Thales, Pythagoras, Zeno, Aristotle, Hippocrates) 2.2 Euclid's Elements (Geometry, Number theory,) 2.3 Hellenistic mathematicians: Archimedes (Integral Calculus), Apollonius (Conic section), Ptolemy (Astronomy)	**5**
1. Write down the contribution of Regiomontanus. 2. Sketch the timeline of different mathematicians with their major works during Renaissance. 3. Describe the favorable conditions for mathematicians of Renaissance to collect and invent different fields of mathematics (geometry, integral calculus, conic sections).	**Unit-III: Mathematics in Renaissance** 3.1 Algebra and Trigonometry: Heron, Hipparchus, Menelaus, Ptolemy, Diophantus, Boethius, Regiomontanus 3.2 Problems and questions about Renaissance	**5**
1. Sketch the timeline of different mathematicians during early modern period. 2. Write down the major characteristics of early modern period in numerical calculation, symbolic algebra, analysis, geometry and calculus. 3. Justify with simple examples of different theorems proved by Cavellieri, Newton, Leibniz. 4. Illustrate diagrammatically the existence of imaginary and complex number. 5. Verify with suitable examples of some theorem on Number theory.	**Unit-IV: Early Modern (Calculus)** 4.1 Geometry (Fermat, Descartes, Desargues, Pascal) 4.2 Calculus (Fermat, Cavellieri, Newton, Leibniz) 4.3 Probability (Fermat, Pascal, Huygens) 4.4 Algebra (Viete) 4.5 Imaginary numbers 4.6 Number Theory (Fermat)	**5**
1. Explain the concept of dawn of modern mathematics. 2. Explain the historical development of Calculus, Analytical Geometry with Format, Desargues, Newton, Leibnitz and Pascal's contribution in modern mathematics. 3. Explain concept of Differential equation, calculus of variations, analysis, groups, linear algebra, geometry (analytic, differential, non-Euclidean), topology, Probability and statistics.	**Unit-V: Modern Mathematics** **5.1** Calculus and analysis: A) Applied Math: Bernoulli, Clairaut, D'Alembert, Euler, Legrange, Laplace, Fourier, Legendre, Poission, B) Infinite Series: Taylor, Maclaurin, Fourier, **5.2** Geometry: A) **Non-Euclidean**: Saccheri, Lambert, Legendre, Gauss, Lobachevski, Bolyai	**7**

4. Give brief introduction of modern mathematical sciences: Galileo, Kepler, and Rene Descartes. 5. Describe the differences in axioms of Euclid and Hilbert. 6. Explain the libration of geometry from the shackle of Euclid.	B) **Projective**: Desargues, Monge, Carnot, Poncelet, Plucker, Steiner, Mobius, Cayley) C) **Hilbert's Geometry:**Undefine, axioms **5.3** **Topology**: Poincare, Euler, Gauss, Riemann) **5.4** **Statistics** and Probability (Poisson, Fisher) **5.5** **Discrete Math:** Pascal, De-Moivre (17^{th}), Euler (18^{th}).	
1. Compare and contrast between calculus and analysis. 2. Explain the need of analysis as a extension of calculus. 3. Sketch the timeline of the mathematicians and their contributions in the development of mathematical analysis rigorously.	**Unit-VI: Analysis** 6.1 Lagrange, Gauss, Abel, 6.2 Cauchy, Riemann, 6.3 Weirstrass Dedekind, Lebesgue,	**5**
1. Explain the story how Galois conceived the idea of an abstract algebra. 2. Sketch the time line of different algebraists and write down their contributions to develop algebra in the form of abstract algebra. 3. Justify why Peacock is known as Euclid of Algebra. 4. Explain the effort of different mathematician for the libration of algebra from arithmetic algebra.	**Unit- VII: Rise of Abstract Algebra** 7.1 Abel, Galois, 7.2 Peacock, Hamilton, 7.3 Grassmann, Cayley, 7.4 Felix Klein, Sylvester, 7.5 De-Morgan, Boole	**8**
1. Explain the contemporary mathematics: analysis, algebra, geometry, probability, set theory. 2. Explain the essence of Logicism, Formalism, and Intuitionism. 3. Explain the essence of Godel's incompleteness theorem.	**Unit- VIII: Set theory/Mathematical Logic** 8.1 Boole, Demorgan, 8.2 Peano, Whitehead 8.3 Russell, Cantor 8.4 Foundation and philosophy of Mathematics	**5**

4. Instructional Techniques

General Techniques: Lecture with illustration, Discussion, Demonstration/ Presentation, Project work and Home assignments, etc.

5. Evaluation

5.1 Internal Evaluation 40%

Internal Evaluation will be conducted by Department based following activities:

1.	Attendances	5 points
2.	Participation in learning activities	5 points
3.	First assignment/term test	10 points
4.	Second assignment/term test	10 points
5.	Third assignment	10 points
	Total	40 points

5.2 External Evaluation 60%

Examination division office of the Dean, Faculty of Education will conduct final examination at the end of semester.

1.	Objective type questions (Multiple choice: 10questions ×1 marks)	10 points
2.	Short answer questions (6 questions×5marks)	30 points
3.	Long answer questions (2questions×10 marks)	20 points
	Total	60 points

Recommended Books

Boyer, C.B. (1968). *A History of mathematics.* New York: John Willy & Sons Inc.

Cooke, R. (1997). *The history of mathematics: A brief course*. New York: John Wiley & Sons, Inc.

Burton (2007). *The History of Mathematics: An Introduction,* (*6th Edition*), the McGraw–Hill Companies.

Reference Books

Eves, Howard (1983). *An introduction to the history of mathematics (5th ed.).* New York: The Saunders Series.

Course Title: **Linear Algebra**

Nature of course: Theoretical	Credit: 3 hrs
Level: M.Ed.	Teaching hours: 48
Course No: Math Ed 525	Semester: Second

1. Course Description

The course 'Linear Algebra' is designed for the students majoring Mathematics Education at master level. This is a specialization course which is intended to finish in one semester. This course covers the algebraic structures which are Modules and Vector spaces. Further it covers the contents of Inner Product Spaces, Linear Mapping & their Algebraic Properties, Bilinear Form & Standard operators and Spectral Theorem & Primary Decomposition Theorem with Jordan Canonical Form. The concepts of module theory including in this course develop the insights of higher mathematics and its connection with the groups, rings and fields. Similarly, the students should aware from how vector spaces play the role in understanding abstract mathematical phenomenon and its links with other mathematical structures. The linear mapping and its properties in vector spaces are vital concepts including the Sylvester Theorem, Hamilton Cayley Theorem, Spectral Theorem and Primary Decomposition Theorem in this course. The application of polynomials in the de-composition of vector spaces provides students powerful logics in this course.

2. General Objectives

The general objectives of this course are as follows:

- To provide the deeper understanding of theoretical concepts of linear algebra including module theory.
- To make students understand and explain the concepts of modules in any ring and distinguish it with vector space.
- To facilitate students to develop computing power in linear algebra.
- To help students in developing positive attitude towards linear algebra.
- To develop insights among students about higher mathematical structures and their applicability in day to day lives.
- To encourage students in developing logical power through mathematical concepts.

3. Specific objectives and contents

Specific objectives	Contents	Periods
• Define modules, sub modules, Quotient modules and module homomorphism and illustrate them with examples. • Prove the elementary properties of modules and sub modules. • State and prove fundamental theorem of module homomorphism. • Define direct sum of modules and prove its basic properties.	**Unit I: Module Theory** 1.1 Modules and sub modules 1.2 Module homomorphism 1.3 Quotient module 1.4 Direct sum of modules 1.5 Torsion modules 1.6 Exact sequences 1.7 Free modules 1.8 Projective and Injective modules	14

Specific objectives	Contents	Periods
• Define torsion and torsion free modules and illustrate them with examples. • Define exact sequence and establish the fundamental properties of module homomorphism. • Explain free modules and prove the elementary properties of free module. Define projective and injective modules and prove elementary properties of them.		
• Review the concepts of vector space, subspace, bases and dimensions of vector space and illustrate them with examples. • Connect the concepts of modules with vector spaces. • Define linear maps with examples • Prove the properties of linear maps • Find the matrix associated with linear maps (identity linear map, zero linear maps, and sum of two linear maps, scalar multiple of linear maps, composite linear maps, and inverse linear maps). • Find the linear map associated with the matrix. • Explain the relation of bases matrices and linear map in the vector space. • Define transition matrix with examples. Find the transition matrix associated with the linear maps.	**Unit II: Linear Maps and Matrices** 2.1 Linear maps 2.2 Properties of linear maps 2.3 The matrix associated with linear maps 2.4 The linear map associated with a matrix 2.5 Linear functional and dual spaces 2.6 Bases, matrices, and linear maps Change of bases	8
• Review the concepts of Scalar product, Hermitian Product ,Bilinear maps, Linear functional and Dual space • Define bilinear forms including symmetric bilinear forms, skew-symmetric bilinear forms and alternating bilinear forms. • Define quadric form with examples. • Find the matrix associated with bilinear forms and quadratic forms.	**Unit III: Bilinear Form and Standard operators** 3.1 Basic concepts – scalar product, hermitian product, Bilinear maps, Linear functional and dual space. 3.2 Bilinear forms 3.3 Quadratic forms. 3.4 Symmetric Operators 3.5 Hermitian Operators 3.6 Unitary Operators 3.7 Sylvesters' Theorem	9

Specific objectives	Contents	Periods
• Define standard operators (symmetric operators, hermitian operators and unitary operators). • Prove the properties of bilinear forms and standard operators. • State polarization identity and use it to prove standard theorems. • State and prove Sylvester's Theorem and find the index of positivity and index of nullity.		
• Define polynomials in variable *t*, polynomial of matrices and polynomial of linear maps. • Prove the properties of polynomial of linear maps. • Define Eigen values and eigenvectors with examples. • Prove the properties of Eigenvectors and Eigen values. • Define characteristics polynomials of matrices and find characteristics polynomials of the matrices. • Determine Eigen values and Eigenvectors of the matrices and linear maps including complex cases. • Determine the triangulizable and diagonalizable matrices. • State and prove Hamilton Cayley Theorem.	**Unit IV: Algebraic Properties of Linear Transformation** 4.1 Polynomial of matrices, polynomial of linear maps and their properties 4.2 Eigen values and eigenvectors 4.3 Characteristics polynomial 4.4 Complex Eigen values and complex eigenvectors 4.5 Triangulation of matrices and linear maps 4.6 Diagonalization of unitary matrices	8
• Prove the properties of symmetric linear maps. • State and prove the Spectral Theorem. • Apply the standard properties of polynomials to decompose the vector spaces. • Define s-invariant subspace and simple s-space. • State and prove Schur's lemma. • Define and determine generalized eigenvectors. • Define Jordan canonical form and reduce the matrices in Jordan canonical forms.	**Unit V: Spectral Theorem and Primary Decomposition Theorem** 5.1 Eigenvectors of symmetric linear maps. 5.2 The Spectral Theorem. 5.3 The unitary operator. 5. 4 Application of polynomial to decomposition of vector spaces. 5.5 Schur's Lemma, Generalized eigenvectors and Jordan Normal (or Canonical) Forms.	9

4. **Instructional Techniques :** This course is theoretical in nature and thus the teacher-centered instructional techniques will be dominant in teaching learning process. However, the instructional technique for this course is divided into two

groups. The first group consists of general instructional techniques applicable to most of the contents. The second group consists of the specific instructional techniques applicable to specific contents of each chapter.

4.1 ***General Techniques:*** Following instructional techniques will be adopted according to the need and nature of the lesson.

- Lecture with illustration
- Discussion
- Question-answer
- Group work presentation and participation

4.2 ***Specific Instructional Techniques***

Unit	Activity and instructional techniques
I	• Individual work and group work Presentation • Solving problem of exercise • Connecting examples with theorems and facilitate to find related examples.
II	• Group discussion for the matrix and linear maps. • Individual work and group work Presentation. • Individual assignment on solving problem of exercise.
III	• Individual work and group work Presentation to explore bilinear form and its associated matrix. • Group work assignment on solving some problem of exercise and then group presentation.
IV	• Individual work and group work to explore polynomial of matrix and linear maps. • Individual assignment to find the solution of numerical problem related to theorems of this unit and presentation. • Group tasks to solve the problem of exercise and discussion in small groups.
V	• Individual work and group work Presentation • Problem solving exercise and group presentation.

5. Evaluations: This course has provisioned two types of evaluations which are categorized into internal evaluation and external evaluations.

5.1 Internal Evaluation 40%

Internal evaluation will be conducted by course teacher based on following activities

1) Attendance	5 Point
2) Participation in learning activities	5 Points
3) First assignment/ midterm exam	10 Points
4) Second assignment/ assessment	10 points
5) Third assignment/assessment	10 Points
Total	40 Points

5.2 External Examination (Final examination) 60%

Examination Division of the Dean office, Faculty of Education will conduct final examination at the end of the semester

1. Objective questions (multiple choice 10 × 1)	10 points
2. Short answer question (6 question × 5 points)	30 points
3. Long answer questions (2 questions × 10 points)	20 points
Total	60 points

Recommended Books

Bhattacharya, P.B, Jain, S.K and Nagpaul, S.R (2008*). First Course in Linear Algebra*. india: Lew Age International House. (For Chapter IV and V).

Datta, K.B. (2002). *Matrix and linear algebra*. New Delhi : Prentice Hall of India (For chapter II)

Lang, s. (1973*). Linear Algebra*.New York: Addision Wesley. (For Chapter II to V)

Bhattacharya, P.B, Jain, S.K and Nagpaul, S.R (2007*). Basic Abstract Algebra*, (Printed in india): Cambridge University Press.(For Chapter I).

Hungerford, T.W (1974). *Algebra*. New YorK: New York Inc.Springer Verlag (For Chapter I).

Reference Books

Maharjan, H.B. (2008). *Rings and Modules*. Kathmandu: Bhunipuran Prakasan.

Bhattarai,B.N. (2011).*Introduction of Rings and Modules*. Kathmandu: Subhakamana Prakashan.

Kunze, H.E. (1996). Linear Algebra. D.T. (1986). *Introduction to Matrices and Linear Transformations*. Delhi: CBS Publishers and Distributers.

Hohn, F.E. (1971). *Elementary Matrix Algebra*. Delhi: Amerind Publishing Co.Pvt.Ltd

Subedi, A. (2014). *Linear Algebra*. Kathmandu: Sunlight Publication.

Course Title: **Projective Geometry**

Nature of course: Theoretical | Credit: 3 hrs

Level: M.Ed. | Teaching hours: 48

Course No: Math Ed 526 | Semester: III

1. Course Description

This course is an introduction course on Projective Geometry designed for Master in Teacher Educator programme at MWU. To accomplish the course students should have a good knowledge of axiomatic system of geometry. The course captures various aspects of geometry with its extensive coverage, but centered on the notion of projective invariants.

2. The General Objectives of the Course

The aim of the course is to provide students with an axiomatic understanding of projective geometry. The course will begin by looking at incidence structure and end with projective space.

On successful completion of the course the students will be able to:

- understand the concept incidence structure and prove basic results of planes
- understand and apply basic results of projective transformation
- analyze and describe connection on Desarguesian and Pappian plane
- understand and analyze projective space

3. Course Outlines

Specific Objective	Content	Teaching Hours (48)
• Define incidence structure • Use isomorphism to establish properties of planes • Define duality and apply then in proving theorems • Define configuration and apply then in proving theorems related to projective plane and subplane	**Unit 1: Incidence geometry** 1.1 Incidence structure 1.2 Planes 1.2.1 Affine plane 1.2.2 Projective plane 1.3 Isomorphism 1.4 Duality 1.5 Configurations 1.6 Subplane and principal subplane 1.7 Order of plane	**15**
• Define perspectivity, projectivity and collineation • Use and apply perspectivity, projectivity and collineation in proving theorems • Define extended collineation and use them in proving theorems	**Unit 2: Collineation** 2.1 Perspectivity 2.2 Projectivity 2.3 Collineation 2.3.1 Matrix induced collineation 2.3.2 Central collineations 2.4 Automorphic collineation	**9**

Specific Objective	Content	Teaching Hours (48)
• Define Desarguesian plane and develop their theorems • Use projecrtivities to prove theorems in Desarguesian planes • Define pappian plane and develop their theorems • Use projecrtivities to prove theorems in Pappian planes	**Unit 3: Desarguesian and Pappian plane** 3.1 Desarguesian plane and related theorems 3.1.1 Desargues triangle theorem 3.2 Quadrangular set and related theorems 3.3 Projectivities in desarguesian plane 3.4 Pappian plane and related theorems 3.5 Fundamental theorem 3.6 Cross-ratio	**9**
• Define conic from projective view point and develop their theorems • Describe and Derive Desargesian and Pascals theorem for conics	**Unit 4: Conics in pappian plane** 4.1 Conics 4.2 The projective conic and related theorem 4.3 Intersection of a range and a point conic 4.4 Closed projective plane 4.5 Desargesian conic theorem 4.6 Pascal's theorem	**9**
• Define Projective space as generalization of projective planes • Define subspace and prove related theorems • Define independent set and prove related theorems • Define dimension and prove related theorems	**Unit 5: Projective Space** 5.1 Projective space and related theorems 5.1.1 subspace 5.1.2 spanning set 5.1.3 Properties of spans 5.1.4 Dimension 5.2 Desargues's theorem 5.3 Homomorphism	**6**

4. Instructional Techniques

4.1 ***General Instructional Techniques***

The instructor will select the method or methods of instruction most suitable for a particular topic. It is quite acceptable to select more than one method and combine them into a single period of instruction if the subject demands it. For example, an instructor could combine a Structured Lesson method to impart theory and follow it up with Demonstration in order to enforce understanding.

4.2 *Specific Instructional Techniques*

Unit	Activity and Instructional Techniques	Teaching Hours (48)
1	Experiences will be shared between groups with a seminar	15
2	The Demonstration method will be involve both giving task to students and showing their task	9
3	Project assignment on some theorems	9
4	Group discussion with sharing	9
5	Guided Discussion	6

5. Evaluation

5.1 Internal Evaluation 40%

Internal Evaluation will be conducted by Department based following activities:

1. Attendances 5 points
2. Participation in learning activities 5 points
3. First assignment/term test 10 points
4. Second assignment/term test 10 points
5. Third assignment 10 points

Total 40 points

5.2 External Evaluation 60%

Examination division office of the Dean, Faculty of Education will conduct final examination at the end of semester.

1. Objective type questions (Multiple choice: 10questions ×1 marks) 10 points
2. Short answer questions (6 questions×5marks) 30 points
3. Long answer questions (2questions×10 marks) 20 points

Total 60 points

6. Recommended Books

Garner, L. E., (1981). *An outline of projective geometry*. New York: North Holand Oxford.

Koirala S. P., Dhakal B. P., (2071). *Introductory projective geometry*. Pathshala Publication, Putalisadak, Nepal

7. Reference book

Coxeter, H.S.M., (1973). P*rojective geometry*. New York: Springer-Verlag, London.

Course Title: **Studies in Mathematics Education**

Nature of course: Theoretical — Credit: 3 hrs

Level: M.Ed. — Teaching hours: 48

Course No: Math Ed 531 — Semester: III

1. Course Description

This course focuses on the nature of mathematics, exposure of different curriculums, research trends in mathematics education, addressing issues in mathematics education through seminar and analytical write-ups. This course aims at giving exposure to students about some of the books written in mathematics education that are used all over the world extensively. It also aims to let students pick up global issue which is locally important, write an essay and give seminar related to components of mathematics education, like nature of mathematics, pedagogies for mathematics, teacher development, assessment strategies and research agenda.

2. General Objectives

The general objectives of this course are as follows:

- To make the students knowledgeable about the strength of books written on Mathematics Education and enable them to appraise them.
- To provide students with in-depth exposures to different curriculums and their materials around the globe.
- To enable the students to present their opinion on the issues of mathematics education.
- To make the students able in preparing and presenting analytical write-ups related to the aspects of mathematics education.
- To enable the students to prepare for and participate actively in the seminar of mathematics education.

3. Specific Objectives and Contents:

Specific Objectives	Contents
• Explain different views on nature of mathematics and math education • Address different issues related to mathematical knowledge. • Explain the dialogical nature of mathematics. • Compare and Contrast among the cultural nature of mathematics and different world views.	**Unit 1: Nature of Mathematics and Mathematics Education (9)** 1.1 Views on the nature of mathematics 1.2 Views on the nature of Math Education 1.3 Issues related to Mathematical Knowledge 1.4 Concept construction and nature of mathematical knowledge 1.5 Dialogical nature of mathematics 1.6 Different world views: Newtonian, Einsteinium, Biomedical, Organic, and Chaotic
• Explain the different approaches to curriculum and development of different Universities of Nepal. • Give critical appraisal of different curriculum all around the globe.	**Unit 2: Curriculum Studies (9)** 2.1 Different paradigms and perspective: Modern and post-modern 2.2 Studies of IX to Bachelor's curriculum materials of different Universities of Nepal

Specific Objectives	Contents
• Compare and contrast the components of different modules, lesson plans and material exercised.	2.3 Components of Lesson Plan/Modules 2.4 Status of materials used in mathematics teaching
• Explain the major shift in mathematics education research. • Justify why social turn gained more attention in research work. • Give critical appraisal how individual experience, reflection can become a knowledge.	**Unit 3: Research in Mathematics Education (9)** 3.1 Role of Cultural diversity in mathematics education research 3.2 Strong social turn in mathematics research education 3.3 Ethnography, self-study, auto-ethnography 3.4 Mathematics literacy as a research issue
• Present the review of the assigned books. • Give critical appraisal of the assigned books.	**Unit 4: Review and appraisal of Selected Books (9)** 4.1 Critical issues in mathematics education 4.2 Issues in mathematics teaching 4.3 What is mathematics really? 4.4 18 unconventional essays on the nature of mathematics 4.5 New mathematics education research
• Prepare and present analytical write-up related to the different aspects of mathematics education. • Give a seminar on the assign issue of mathematics Education.	**Unit 5: Analytical Write-up and Seminar Conduction (12)** 5.1 Book Review 5.2 Long Essays 5.3 Seminar

4. General Techniques

Understanding of any concept can be judged only when students demonstrate through reading, writing and advocating students' viewpoint. So, these general and specific techniques in each of unit are given below.

4.1 General Instructional Techniques

The general instructional techniques will be intensive and extensive reading, discussion, lectures, projects, seminars, and analytical writings.

4.2 Specific Instructional Techniques

Unit	Specific Activities carried out in different Units
I	Discussion, Lectures and internet browsing.
II	Bringing curriculum of different countries and compare and contrast among their key ingredients.
III	Internet browsing for the sample of different researches on social and cultural aspects of mathematics.
IV	Intensive and extensive reading of different seminal textbook written on the issues of mathematics education is expected.

Unit	Specific Activities carried out in different Units
V	a) Book Review (1000 words approx 4 pages): The following key features must be included: i. General information (Author, date, title, publisher, place of publication) ii. Summary of key sections of the book iii. Summary of key issues presented in each sections/chapter of the book iv. Information about the Potential reader of the book b) Long Essays (4000 words approx 16 pages): Students are expected to select an issue of global/local in nature in mathematics education and address it with sufficient fact, figure and arguments in their own style. Conventional as well as unconventional way of writing is desired. c) Seminar: (1500 words approx 6 pages): Brainstorming session is required in order to students' exposure to select a good and burning issue in mathematics education. For example: Should we prepare world citizen through our mathematics education course?

5 Evaluation

5.1 Internal Evaluation 40%

Internal evaluation will be conducted by course teacher based on following activities

1) Attendance	4 Points
2) Participation in learning activities	6 Points
3) First assignment/ midterm exam	10 Points
4) Second assignment/assessment	10 Points
Total	40 Points

5.2 External Examination (Final examination) 60%

Examination Division of the Dean's office will conduct final examination at the end of the semester

1. Objective questions (multiple choice 10 × 1)	10 points
2. Short answer question (6 question × 5 points)	30 points
3. Long answer questions (2 questions × 10 points)	20 points
Total	60 points

6. Recommended and References

Recommended

Doll, W. E. (1993). *A post-modern perspective on curriculum*. New York: Teachers College Press. (Unit II)

Ernest, P., Greer, B. & Shreeraman, B. (Ed). (2009). Critical issues in mathematics education. Charlottte, NC: Information age publishing. (Unit V)

Gates, P. (2001). *Issues in mathematics teaching.* London and NY: Routledge and Falmer (Unit I, IV)

Hersh, R. (Ed) (1997) *What is mathematics really?* NY: Oxford University Press. (Unit I, IV)

Hersh, R. (Ed.) (2006). *18 unconventional essays on the nature of mathematics*. NY: Springer. (Unit I)

Maaz, J. & Schloeglmann, W. (Ed) (2006). *New mathematics education research and practice*. Rotterdam, The Netherlands: Sense (Unit III)

References

Bachman, D. (2007). *Advance Calculus Demystified: A self-teaching guide*. New York: Mcgrow Hill. (Unit II)

Baumslag, B. (2000). *Fundamentals of teaching mathematics at University level*: Imperial College press. (Unit II)

Handa, Y. ( ). *What does understanding mathematics mean for teachers? Relationship as a metaphor for knowing*. Routledge (Unit I)

Nardi, E. & Iannone, P. ( ). : *How to prove it: A brief guide for teaching proof to year 1 mathematics graduates*. Norwich, UK: (Unit II)

PISA (2010). *Mathematics teaching and learning strategies in PISA*: OECD (Unit II)

Robert, A. W. (1996). *Calculus: The dynamics of change*. Mathematical Association of America (Unit II)

Upadhyay, H. P. (2013). A dialogue: mathematics as an umbrella concept unifying all disciplines. Kathmandu: *Council of mathematics Education*. (Unit V)

Teaching Undergraduate Mathematics Using ICT

Course Title: **ICT in Mathematics Education**

Nature of course: Theo+ Prac	Credit: 3 hrs
Level: M.Ed.	Teaching hours: 24T + 48P
Course No: Math Ed 532	Semester: III

1. Course Description

This course is designed to provide the students with wider knowledge to facilitate understanding, competency and interest in mathematics for all students. For understanding mathematics succinctly there is need to bridge the gap between mathematics taught in school and college. For competency and interest in mathematics there is a need to inculcate the skills of handling ICT in students. This course will also provide hands-on experience of handling mathematical software with practical activities.

2. The General Objectives of the Course

General objectives of the course are as follows:

- To enrich the students on the fundamental concepts for teaching at school and college level.
- To apply and work with basic digital literacy skills.
- To plan instructional methods and strategies using ICT tools and features.
- To make students able to use mathematical software, and use them to enhance teaching and learning activities.

3. Course Outlines

Specific Objective	Content
• Expose the system of mathematical reasoning for generating contents in maths.	**Unit I: Intuition and Proof (5)** • Fundamental methods of proofs (Direct, contradiction, counter example)
	Unit II: Arithmetic, Algebra and Geometry (8) • Divisibility test, Fundamental theorem, prime numbers, GCD, • Factor theorem of algebra, cubic and higher order equation, Real and Complex number • Area and volume, Heron's and Pick's theorem
	Unit III: Function, trigonometry, and vectors (6) • Types of models, Useful trigonometrically relationships and Graphs,
	Unit IV: Data analysis and probability (5)

Specific Objective	Content
• Apply different features of MS-word in word processing. • Apply and use different features of Spreadsheet • Prepare and present power point slide applying different animation schemes and connect document using hyperlink. • Create and use different web (online) communicating software. • Use different multimedia system to present learning materials in classroom.	**Unit V: Basic Digital Literacy for Teachers (13)** 5.1 Word processing, Spreadsheet, and presentation skills (MS word and MS Power point) 5.1.1 Advance text application, heading, paragraph, and table 5.1.2 Referencing features: footnote, endnote and captions, create table of contents and references 5.1.3Sections and page breaks 5.1.4 Track and comment 5.2 Application and work with Home, Insert and Formula tab in MS excel 5.3 Preparation and presentations through PPT 5.3.1 Inserting clip arts, audio and video files 1.1.2 Adding animations, and recording 5.3.3 Use hyperlink 5.4Web Technologies and communication 5.4.1 Email and Blog (Google) 5.4.2 Cloud storages {Google drive, Dropbox} 1.1.3 Skype, Facebook, VSee 5.4 Multimedia systems (e-lacta, Audacity)
• Develop software based teaching models for various concepts of schools and college using GeoGebra	**Unit VI: Geogebra for Math Teachers (35)** • Teaching Mathematics using Geogebra-10 (two dimensional and three dimensional graphics) • 2-D, 3-D Graphics • Equations, Probability and Statistics • Algebra and Trigonometry • Differential Integral calculus • Linear Algebra • Multivariate Calculus • Ordinary differential equation

4. Instructional Techniques

4.1 General Instructional Techniques

The instructor will select the method or methods of instruction most suitable for a particular topic. It is quite acceptable to select more than one method and combine them into a single period of instruction whenever it is needed. For example, an instructor could combine a structured-lesson-method to impart theory and follow it up with demonstration method in order to enforce understanding. So, following general method of instruction will be adopted:

- Lecture
- Demonstration
- Discussion
- Group Work

4.2 Specific Instructional Techniques (Practical)

Unit	Activity and Instructional Techniques	Teaching Hours (48)
V	• Develop multimedia presentation. • Demonstrate the Project work with multimedia.	13
VI	• Modeling on mathematical content • Project work and presentation	35

NB: The instructional techniques are practical base and will be done in ICT Lab.

5. Evaluation

5.1 Internal Evaluation 40 Points

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

1) Attendance 5 points
2) Participation in learning activities 5 points
3) First assignment/Mid-term exam 10 points

Some example for assignment may be

Develop a blog and present its importance in teaching: (2 points for design+ 3 points for presentation)

4) Second assignment/assignment (1 or 2) 10 points

Some example for assignment may be:

Prepare a report on use and importance of mathematical software in teaching mathematics and present (2 points for report+ 3 points for presentation)

5) Third assignment/assignment (1 or 2) 10 points

Some example for assignment may be

Prepare an instructional model to teach concept of mathematics using instructional software and present (2 points for model+ 3 points for presentation)

Total 40 points

5.2 External Examination (Paper pencil test) 30 points

- Objectives 1 mark x 5 questions = 5 points
- Short answer questions 5 marks x 5 questions = 25 points

5.3 External Evaluation (Practical: 30)

Examination Division, Office of the Dean, Faculty of Education will appoint an external to conduct final examination at the end of the semester as follows: (External+Internal)

Evaluation on	Time allocation	External Weight :20	Internal Weight: 10
Examiner will give a question to prepare a teaching module on some mathematical contents using Geogebra	30 minutes (The students will complete the task)	20	10

6. Recommended and Reference Books

Recommended Books

GeoGebra 5.0 Manual - GeoGebraWiki. (n.d.). Retrieved December 5, 2015, from http://wiki.geogebra.org/en/Manual

Mathematica Manual–Wolfram Mathematica. (n.d.). Retrieved December 5, 2015, from http://www.johnboccio.com/MathematicaTutorials/03_Mathematics And Algorithms.pdf

Reference Books

Arangala, C. (2015). *Exploring linear algebra: labs and projects with Mathematica*. Boca Raton: CRC Press, Taylor & Francis Group.

Shingareva, I., & Lizárraga-Celaya, C. (2009). *Maple and mathematica: a problem solving approach for mathematics* (2nd ed). Wien/ ; New York: Springer.

Szabo, F. (2015). *The linear algebra survival guide: illustrated with Mathematica*. Amsterdam/ ; Boston: Academic Press ... an imprint of Elsevier.

Course Title: **Trends in Mathematics Education**

Nature of course: Theoretical — Credit: 3 hrs

Level: M.Ed. — Teaching hours: 48

Course No: Math Ed 533 — Semester: III

Course Description

This course deals with skill and knowledge in various aspects of mathematics education at different levels of the school and the University. Besides this, it also provides an overview on the themes, issues and the recommendations made by different international education conferences. This course deals with the present status and trends of research in mathematics education too.

General Objectives: The following general objectives of this course are :

- To let students sketch the trends that are observed all round the globe in mathematics education at different levels of schooling especially with respect to curriculum materials, research and sociological components.
- To enable students sketch the trends in Basic areas of mathematics: geometry, algebra, arithmetic teaching in different countries including Nepal.
- To have students elucidate the trends how the concept applied mathematics changes with time.
- To enable students sketch the different trends that are observed in the historical development of different Commission, Unions, Conferences, and Olympiads.
- To acquaint the students with the critical appraisal to address different issues (Olympiads, Popularization, Gender differences, Ethno-mathematics) in Mathematics Education.
- To provide students knowledge of the trends (Historical, Modern) that are observed in the research in mathematics education.

Specific Objectives	Contents
1. Sketch the trends that are seen in the history of mathematics education in terms of philosophy, learning theory, and method of teaching. 2. Sketch the trends that are observed all round the globe in mathematics education at different levels of schooling especially with respect to curriculum materials, research and sociological components. 3. Appraise critically the two major forces: New math and NCTM that brought changes in mathematics education.	**Unit 1: Mathematics Education at Schools and at the University (13hrs)** 1.1 Introduction 1.2 Trends in Math Education at Pre-primary/Primary Level 1.3 Trends in Math Education at Lower/Secondary Level 1.4 Trends in Mathematics Education at Upper Secondary, College 1.5 Trends Mathematics Education at University Education 1.6 Trends in Adult and Continuing Education 1.7 Trends in Methods and Media 1.8 Two major forces for Mathematics Education

Specific Objectives	Contents
1. Give critical appraisal of emergence of different geometries Euclidean, non-Euclidean geometry. 2. Give critical appraisal of emergence of Modern number theory and arithmetization. 3. Give critical appraisal of emergence of Modern Algebra. 4. Give comprehensive and eclectic view on mathematics education with respect to three basic areas.	**Unit 2: Trends in Three Basic areas in Schools (7 hrs)** 2.1 Reforms in Geometry 2.1.1Reforms in School Geometry 2.1.2 Trends in different countries 2.1.3 Issues and problems in teaching geometry for 21st century 2.2 Reforms in Arithmetic 2.2.1 Brief sketch of the development 2.2.2 Palpable arithmetic 2.2.3 Figurative arithmetic 2.2.4 Arithmetic for learning mathematics 2.3 Reform in Algebra 2.3.1 Rhetorical algebra 2.3.2 Syncopated Algebra 2.3.3 Symbolic Algebra 2.4 Issues and Problems on the Teaching of three basic areas of mathematics for 21st Century
1. Explain the trends how the concept applied mathematics changes with time. 2. Explain the reason why to teach application of mathematics in different levels of schooling. 3. Explain the issues and problems of applied mathematics in mathematics education. 4. Analyze the impact of applied mathematics on mathematics education.	**Unit 3: Educational Implications of Applied Mathematics (5 hrs)** 3.1 Introduction 3.2 Trends in Teaching Applied Mathematics 3.3 Issues and Problems of Applied Math in Math Education 3.4 The Impact of Applied Math on Math Education 3.4.1 Mathematical subject matter in school 3.4.2 Effect of applied maths on pedagogy 3.4.3 Application of maths on vocational subject
1. Differentiate one from others among conferences, commission, union, society, seminar, workshop, academia etc. 2. Sketch the different trends that are observed in the historical development of different Commission, Unions, Conferences, and Olympiads. 3. Describe the aims, activities and responsibilities of ICMI and IMU.	**Unit 4: Mathematics Education Conferences (7 hrs)** 5.1 International Mathematics Union (IMU) 5.2 International Commission on Mathematical Instruction (ICMIs) 5.3 Regional mathematics congress in Different Countries 5.4 International Congress on Mathematical Education (ICMEs) 5.5 Olympiads

Specific Objectives	Contents
4. Describe the achievement of different international congresses (ICMEs) and Regional conferences. 5. Review different themes in national and international Olympiads.	
1. Give critical comment on the issues and problem of teaching and assessment in mathematics. 2. Give critical appraisal to address different issues (Popularization, Gender differences, Ethno-mathematics) in Mathematics Education. 3. Describe different formalities (selection of Jury, conditions of participation,, and topics asked) in ICME. 4. Give critical comments on tensions occurred while dealing with mathematics education for 21st century stakeholders.	**Unit 5: Issues in Mathematics Education (8 hrs)** 5.1 Issues in the social context of mathematics education (i) Social issues: Emotion, Value, achievement in math education (ii) Issues in Teaching and learning (iii) Assessment Issues (TIMSS, PISA, IEA) (iv) Issues in Culture of mathematics teaching, (v) Issues in individual difference and special need (vi) Popularization, (vii) Gender, (viii) Ethno-mathematics 5.2 Issues on Different Tension in 21st century
1. Sketch the trends (Historical, Modern) that are occurred in the research in mathematics education. 2. Describe three traditions in research in mathematics education in terms of goal of enquiry, role of evidence, role of theory. 3. Compare and contrast different kinds of research in mathematics education with special reference philosophy and methodology. 4. Explore some areas of viable researchers in mathematics education for future.	**Unit 6: Research in Mathematics Education (8hrs)** 6.1 Introduction 6.2 Kinds of Research in Mathematics Education 6.3 Trends in Mathematics Education Research: Historical Trends in Math Education Research (1950-80) Modern Trends in Math Education Research (Since1980), and the Trends Towards Action Research (Epistemological Foundation of Action Research) 6.4 Areas of Research: Curriculum, Methods & Materials, Learning and Learners and Learning & Teachers and Some Research Abstract on Curricula, Methods and Learning 6.5 Forecasts and Recommendations

General Instructional Technique: Lecture and Discussion method

Specific Instructional Techniques

Unit I	Reading and reflecting on the different aspects of mathematics education at different levels of schooling.
Unit II	Internet browsing and presentation of different aspects of mathematics in group
Unit III	Self-study, Discussion comparison and presentation
Unit IV	Net browsing, reading of the text and reporting about the resolutions of different conferences
Unit V	Critical discourse on different issues, presentation and reflective writing
Unit VI	Present comparative view on different types of research and trends in research

Evaluation

Internal Evaluation 40%

Internal evaluation will be conducted by course teacher based on following activities

1)	Attendance	5 Point
2)	Participation in learning activities	5 Points
3)	First assignment/ midterm exam	10 Points
4)	Second assignment/assessment	10 Points
5)	Third assignment/ assessment	10 points
	Total	40 Points

External Examination (Final examination) 60%

Examination Division of the Dean office, Faculty of Education will conduct final examination at the end of the semester

1.	Objective questions (multiple choice 10 × 1)	10 points
2.	Short answer question (6 question × 5 points)	30 points
3.	Long answer questions (2 questions ´ 10 points)	20 points
	Total	60 points

Recommended books

Clements, M. A. & Ellerton, N. F. (1996). *Mathematics education research: Past, Present, and future*. Bankok: Unesco

Conway, P. P. ; & Sloane, F. C. (2005). *International trends in post-primary mathematics education: Perspectives on learning, teaching and assessment*. Washington: National Science Foundation.

Gates, P. (2001). *Issues in mathematics teaching*. (Eds.). London: Routledge, Falmer: Taylor Francis Group.

Greewood, D. J. Levin, M. (998). *Introduction to action research: Social research for social change* New Delhi: SAGE Publications.

Reference

Pandit, R. P. (064). Recent trends in mathematics education. Kathmandu:

Upadhyay, H. P. et al. (2064). Trends in mathematics education. Kathmandu: Balbalik Education Publication Pvt. Ltd.

Kapur, J. N. (). *Fascinating world of mathematical science*. Vol. 1-6. New Delhi: Mathematical Science Trust Society.

Trentacosta, J. (1997). *Multicultural and gender equity in the mathematics classroom*, Yearbook, NCTM.

Course Title: **Operation Research**

Nature of course: Theoretical — Credit: 3 hrs

Level: M.Ed. — Teaching hours: 48

Course No: Math Ed 534 — Semester: III

1. Course Description

This course Operation Research (OR) is concerned with the optimal allocation of scarce resources and optimal strategies. First three chapters are based on the simple concept of probability where as the second three chapters deal with the deterministic methods of linear programming. Last chapter deals with the best strategies for ordering and holding the inventory and best time for replacement of equipments.

2. General Objective

The general objectives of this course are as follows:

- To make students able to explain the nature and phases of operations research
- To enable the students to understand techniques of solving the problems of Markov chains and Simulation
- To make the students familiar with various methods of queuing theory any and game theory.
- To equip the students with methods, techniques and procedures of inventory models and system, linear programming, transportation and assignment problems.
- To acquaint the students with the formulation, execution and evaluation to the problem of project management.

3. Specific Objectives and Contents

Objectives	Contents
• Explain the origin, meaning, and nature and phases of operations research (OR).	**Unit I: Introduction (1)** 1.Origin, Meaning and Nature and phases of Operation Research
• Describe the problems that lead to Markov Chain and formulate the process. • Use the theory of probability to analyze problems by using Markov Chain including Ergodic chain • Determine the steady state condition and absorbing Markov Chains	**Unit II: Markov Chains (6)** 2.1 Formulation of processes as a Markov Chain 2.2 Probability Analysis by Markov Chains 2.3 Ergodic Markov Chains 2.4 Determination of Steady-State Conditions 2.5 Absorbing Markov Chains and Their Analysis.
• Describe the meaning of queuing system and its characteristics • Classify various symbols, notations and queuing models. • Describe Poisson's Process and exponential distribution to the study of queuing theory. • Describe the distribution of interval and service times • Explain Poisson's Queue and their Characteristics.	**Unit III: Queuing Theory (6)** 3.1 Queuing System and Its Characteristics 3.2 Classification of Queuing Models, Symbols and Notations 3.3 Poisson's Process and Exponential Distributions 3.4 Distribution of Interval and Service Times 3.5 Classification of Queues: Poisson's Queue and their Characteristics.

Objectives	Contents
• Describe the theory of simplex method and dual-simplex method • Use non-linear programming methods to solve LP problem	**Unit IV: Linear Programming (6)** • Introduction : slack, surplus and artificial variable • Theory of simplex method • Dual-simplex method • Integer programming • Non- linear programming methods
• State standard form of transportation problem. Describe the steps of transportation problem with example • Use the linear programming formulation of the transportation problem. • Explain the various types of transportation problem and solve the given Transportation problem • Explain various methods of solutions of transportation problems. • Use enumeration, LPP transportation & Hungarian method to the solution of assignment problem.	**Unit V: Transportation and Assignment Problem (10)** 5.1 The transportation problem 5.1.1 Standard form 5.1.2 Steps of Transportation problem 5.1.3LPP of the transportation problem. 5.2 Types of transportation problem 5.3 Methods of Solution of Transportation problem 5.3.1 North-West Corner Method 5.3.2 Vogel's Approximation Method 5.4 Assignment Problem: 5.5 Method of solution of assignment problem 5.5.1 Enumeration method 5.5.2 linear programming method 5.5.3Transportation method 5.5.4 Hungarian method.
• Explain the meaning of game and describe various types of games. • Describe various types of strategies used in two person zero –sum game • Solve the matrix game using saddle point. • Solve the game by probability method. • Solve the game by rule of dominance,. • Solve the same by graphic. • Solve the game by LPP and algebraic methods.	**Unit VI: Game Theory (7)** 6.1 Introduction 6.2 Types of Game 6.2.1 Competitive Games 6.2.2 Matrix Game 6.2.3 Two Person Zero Sum Game 6.3 Strategies in Games 6.3.1 Pure Strategy 6.3.2 Mixed Strategy 6.3.3 Mini-max and Maxi-min strategy 6.3.4 Related theorems 6.4 Expected Value of a Game, 6.4.1 Optimal Strategies for Non-strictly Determined Games and its theorem (Games without saddle point) 6.5 Methods of Solution to the Games 6.5.1 Method 1: Saddle Point Method

Objectives	Contents
	6.5.2 Method 2: Probability Method 6.5.3 Method 3: Rule of Dominance6. 6.5.4 Method 4: Graphic Method 6.5.5 Method 5: Method of LPP 6.5.6 Method 6: Algebraic Method
• Derive the formula and solve economic lot size inventory problems related to uniform rate of demand, infinite production rate and having no shortage • Derive the formula and solve economic lot size inventory problems related to different rate of demand, in different production cycles, infinite production rate and having no shortage • Derive the formula and solve economic lot size inventory problems related to uniform rate of demand, finite rate of replenishment having no shortage • Derive the formula and solve economic lot size inventory problems related to uniform rate of demand fulfilled in constant time, infinite rate and shortage allowed. • Derive and use formula for solving economic lot size inventory problems related to Uniform rate of demand, production instantaneous, shortage allowed. • Derive and use formula for solving problems related to replacement and maintenance models.	**Unit VII: Inventory and Replacement Models (12)** 7.1 Concepts basic to Inventory Models **7.2 Model I:** Uniform rate of demand, infinite production rate and having no shortage **7.3 Model II:** Different rate of demand, in different production cycles, infinite production rate and having no shortage **7.4 Model III:** Uniform rate of demand, finite rate of replenishment having no shortage **7.5 Model IV:** Fixed Time Model: Uniform rate of demand fulfilled in constant time, infinite rate and shortage allowed. **7.6 Model V:** Optimal Quantity q per run Economic lot size, Uniform rate of demand, production instantaneous, shortage allowed, Replacement and maintenance models

4. Instructional Techniques

4.1 General Instructional Techniques

Following instructional techniques will be adopted according to the need and nature of the lesson.

- Lecture with illustration,
- Discussion,
- Question-answer
- Collaborative learning

4.2 Specific Instructional Techniques

Unit	Activity and Instructional Techniques
Unit 1	Both of teacher and students will engaged in Internet Browsing for the steps of OR
Unit 2	iscussion about the situation where Markov chain is applicable. Use Probability techniques in solving Markov Chain Problems.
Unit III	Fitting of data into computer and determining the shape of queuing system (Poisson, normal, and exponential)
Unit IV	Graphical presentation of different con-straints and finding the optimal solution of linear and non programming problems.
Unit V	Use linear programming while solving transportation and assignment problems.
Unit VI	Iscus the context where different types of Game involved. Use of linear programming while solving game theory problem.
Unit VII	Use calculus to find the optimal order size, optimal order time, lead time and use them in solving practical problems.

5 Evaluation

5.1 Internal Evaluation 40%

Internal evaluation will be conducted by course teacher based on following activities

- Attendance 5 Points
- Participation in learning activities 5 Points
- First assignment/ midterm exam 10 Points
- Second assignment/assessment 10 Points
- Third assignment/assessment 10 Points

Total 40 Points

5.2 External Examination (Final examination) 60%

Examination Division of the Dean's office will conduct final examination at the end of the semester

1. Objective questions (multiple choice 10×1) 10 points
2. Short answer question (6 question×5 points) 30 points
3. Long answer questions (2 questions×10 points) 20 points

Total 60 points

6. Recommended Books and References

Recommended Books

Gupta, P.K. & Hira, D.S (2007). *Operations research* (4th Edition). Delhi: Sultan Chand and Sons

Shamling, J. (1989). *Operations research*, US: Macmillan.

Sharma, J. K.(2012). *Operations research*. Delhi: Macmillan India Limited.

References:

Brown , R. F., & Brown B. W. (1992). *Finite Mathematics.* New York: Ardsley House Publishers, Inc.

Pandit, R. P. (2011) *An Introduction to operations research*. Kathmandu: Indira Pandit

Swarup, K; Gupta, P.K.,& Mohan, M. (2009). *Operations research*.. Delhi: Sultan Chand and Sons.

Bronson, R. (1983). Theory and problems of operation research, Schaum's Series. Singapur: McGrow-Hill Book Company.

Course Title: **Complex Variable and Numerical Analysis**

Nature of course: Theoretical | Credit: 3 hrs

Level: M.Ed. | Teaching hours: 48

Course No: Math Ed 535 | Semester: III

1. Course Description

This course two areas of higher mathematics: Analysis of Complex Variable and Numerical Analysis. Complex variable is an essential part of mathematics which is a powerful tool for solving a wide array of problems arising in applications. The concept of complex variable and its related items are helpful to solve many problems that are either very difficult or virtually impossible to solve by other means.Therefore, this part is supposed to provide techniques of analyzing variables as well as methods to solve many problems applicable to different branches of mathematics, science and Engineering through the discussion on properties of complex numbers, complex differentiation, Integration, series and residues.

The second part consists of introductory text of numerical methods. This part supports to reach at the solution of scientific, business and engineering problems through the use of a set of numerical data. Therefore, the aim of this part is to make the students realize the necessity of numerical methods which is helpful to deal easily with such problems. These methods will also help students to reduce complex mathematical expressions in terms of simple arithmetic operations.

2. General Objectives

The general objectives of this course are as follows:

- To enrich the students the knowledge of the function of complex variable as a generalization of the function of real variable.
- To let students understand the conformal transformation and discuss on special transformations.
- To enable students discuss the properties of complex integration.
- To develop the skill of students in solving different types of complex integrals using Cauchy's residue theorem.
- To familiarize students the techniques of numerical interpolation, differentiation and integration.
- To enable students discuss on different methods of solving linear system of equations.

3. Specific Objectives and Contents

Specific Objectives	Contents
• Define function of complex variable. • Explain the analytic function with examples. • Prove Cauchy-Riemann Equations. • Construct analytic functions.	**Unit I: Complex Number System and Analytic Functions (5)** **1.1.** Functions of a complex Variable, bounded and unbounded sets domain and range, Jordan curve theorem, limits, continuity and differentiability of complex functions **1.2** Analytic functions **1.3.** Necessary and sufficient condition of differentiability **1.4.** Regular functions harmonic functions **1.5.** Construction of analytic functions

Specific Objectives	Contents
• Explain contour integral and its properties. • Prove Cauchy-Goursat theorem. • Prove the theorems on complex integration and solve related problems.	**Unit II : Complex Integrals (8)** **2.1.** Contour integrals **2.2.** Cauchy-Goursat theorem and its extensions **2.3.** Cauchy integral formula **2.4.** Derivative of analytic functions,higher order derivatives **2.5.** Morera's theorem **2.6.** Liouville's theorem **2.7.** Poisson,s integral formula **2.8 .**Fundamental theorem of integral calculus **2.9.** Fundamental theorem of algebra
• Prove the results related to convergence of sequence and series. • To define power series and find out its radius of convergence. • Prove the properties of integration and differentiation of power series • To prove Taylor,s theorem and Laurent,s theorem and • To expand functions in the form of these series.	**Unit III: Series (5)** **3.1** Convergence of sequence and series **3.2** Absolute convergence **3.3** Cauchy sequence **3.4** Uniform convergence **3.5** Power series **3.6** Radius of convergence of power series **3.7** Term by term differentiation and integration of power series **3.8** Taylor's theorem **3.9** Laurent's theorem
• To find zeros and poles of an analytic function • To identify different types of singularities • To prove related theorems on zeros, singularities and poles • To prove maximum and minimum modulus theorems • To solve problems related on poles and singularities	**Unit IV: Singularities and Poles (5)** **4.1.** Zeros, singular points and poles of analytic function **4.2**.Entire function **4.3** Limiting points of zeros and poles **4.4** Riemann,s theorem **4.5** The behavior of a function near an essential singularity **4.6** Maximum modulus theorem **4.7** Schwartz lemma **4.8** Principal of argument **4.9** Rouches, theorem **4.10**Problems related to Zeros, poles and singularities
• Explain the residue at a point with examples.	**Unit V :Calculus of Residues (6)** 5.1 Residue theorem 5.2 Residue at poles

Specific Objectives	Contents
• Prove the residue theorem • Evaluate real definite integrals • Evaluate the improper real integrals • Evaluate the integral involving sine and cosines	5.1 Evaluation of improper real integrals 5.2 Improper integral in solving series of sine and cosines 5.3 Definite integrals involving sine and cosine
• Define conformal transformation • Transform various curves and regions by elementary functions. • Discuss some special transformations	**Unit VI: Mapping by Elementary Functions (5)** 6.1 Conformal mapping 6.2 Fixed or invariant points of transformation 6.3 Some general transformations 6.4 Linear transformations 6.5 Bilinear transformation 6.6 Cross ratio 6.7 Fixed points of a bilinear transformation 6.8 The transformation z^n,Where n is a positive integer 6.9 The transformation w=sinz, the transformation $w=e^z$ and w=logz; the transformation $w=z^2$and $w=z^{1/2}$
• Explain finite differences • Derive Newton's formula for interpolation. • Derive central difference interpolation formula • Determine the interpolation with unevenly spaced points • State the properties and errors in the cubic spline derivatives. • Explain interpolation by iteration. • Explain the method of double interpolation.	**Unit VII: Interpolation (6)** 7.1 Errors in polynomial interpolation 7.2 Finite differences 7.3 Detection of errors by the use of difference table 7.4 Difference of a polynomial 7.5 Newton's formula for interpolation 7.6 Central difference interpolation formula 7.7 Practical interpolation 7.8 Interpolation with unevenly spaced points 7.9 Interpolation with cubic splines 7 Divided differences and their properties 7 Inverse interpolation 7 Double interpolation

Specific Objectives	Contents
• Discuss different methods of numerical differentiation. • Determine the maximum and minimum values of tabulated functions. • Discuss on numerical integration. • Apply trapezoidal and Simpson's rule in integration • State Gauss Legendre quadrature.	**Unit VIII: Numerical differentiation and integration (4)** 8.1 Numerical differentiation 8.2 Maximum and minimum values of tabulated function 8.3 Numerical integration 8.4 Trapezoidal rule 8.5 Simpson's 1/3 rule 8.6 Simpson's 3/8 rule 8.7 Gauss- Legendre quadrature
• To discuss the two categories to be used in solving a system of linear equations (direct and iterative methods). • To identify different methods under direct method and use them in solution of linear systems. • To describe iterative methods and use them in solution of linear systems.	**Unit IX: Matrices and Linear Systems of Equations (4)** 9.1 Solution of linear equations by direct methods, Matrix inversion method, Gaussian elimination method, III conditioned matrices method, Method of factorization 9.2 Solution of linear systems by iterative methods: Jacobi method, Gauss-Seidel method.

4. Instructional Techniques

This course being theoretical in nature, teacher-centered instructional techniques are used. These techniques are divided into two parts as follows:

General techniques: Lecture, discussion, question-answer and problem solving

Specific instructional techniques

Units	Activity and instructional techniques
Unit I	• Individual and group discussion on the complex functions and gives some questions to find the limit, continuity and differentiability of complex functions. • Group work and individual assignments on construction of analytic functions .
Unit II	• Individual and group discussion on the complex integration by Cauchy integral formula. • Group work and individual assignments on problems of integration.

Units	Activity and instructional techniques
Unit III IV	• Individual and group assignments on the expansion of functions using Taylor's and Laurent's series. • Individual and group discussion on the convergence of series • Individual assignment and group work to find radius of convergergence of power series
Unit V	• Individual and group discussion on the residue and pole • Individual and group assignments on problems of residue and contour integration .
Unit VI	• Individual and group discussion on mapping of various curves and region by elementary analytic functions with assignments on related exercises. • Individual and group presentation.
Unit VII	• Individual and group discussion on calculating error, finite differences, interpolation formula, interpolation by iteration and the method of successive approximations. • Group work assignment on solving the problem related to exercises.
Unit VIII	• Group and individual discussion on numerical differentiation and integration with assignments on application of numerical analysis.
Unit IX	• Individual and group discussion on use matrix to solve linear system of equations by different methods. • Group and individual assignments to solve linear system of equations with presentation..

5. Evaluation:

Internal evaluation

Internal evaluation will be conducted by subject teacher based on following activities:

a. Attendance	5 points
b. Participation in learning activity	5 points
c. First Assessment test	10 points
d. Second Assessment test	10 points
e. Third Assessment test	10 points
Total	40 points

External Evaluation:

Faculty of Education, Examination division will conduct final examination of 60 points at the end of semester. This weightage will be divided in final examination paper as follows :

Objective questions	(10 × 1)	10 points
Short answer questions	(6 × 5)	30 points
Long answer questions	(2 × 10)	20 points
Total		60 points

Recommended books

Churchill, R.V. (1996): *Complex variable and application.* New Delhi: Mc-Graw Hill (Unit I-VI)

Sastry, S.S. (1990). *Introductory methods of numerical analysis*. New Delhi: Prentice-Hall of India (Unit VII-IX)

Reference books

Alford, L.V.(1979). *Complex analysis*. Tokyo: Mc-Graw Hill

Goel, J.K. and Gupta K.P.(2009) Functions of a complex variable. Meerut : Pragati Prakashan

Pandey,U.N.(2012). *Functions of a complex variable*. Kathmandu: Shubhakamana Prakashan Pvt Ltd

Sharma, J.N. (1994). *Functions of complex variable*. Meerut: Krishna Prakashan Mandir.

Gupta, S. and Sharma, A. (2014). *Numerical analysis*. New Delhi: S .K. Katariya and Sons

Spigel, S.et al. (2010). *Schau's outlines complex variables.* New Delhi: Tata Mc-Graw Hill Education Private Limited (Special Indian edition)

Course Title: **Topology and Measure theory**

Nature of course: Theory | Credit: 3 hrs

Level: M.Ed. | Teaching hours: 48

Course No: Math Ed 536 | Semester: III

Course Description

The course 'Topology and Measure Theory' is designed to facilitate the students to gain deep and sound theoretical concepts of topological properties and measure theory. The topics on topology address the point-set topological properties on Metric Spaces and Topological Spaces with compactness and connectedness. The topics on Measure Theory address the concept of Lebesgue outer measures, measurable sets and functions on real lines and these concepts are further extended on n-dimensional Euclidian space Rn; properties of Lebesgue integral and Lp spaces.

General Objectives of the Course

The general objectives of this course are:

- To help the students to understand the topological properties on metric spaces and topological spaces.
- To empower the students to prove the theorems related to metric properties, topological spaces, connected and compact spaces.
- To make the students able to understand basic concepts of Lebesgue outer measure, measurable sets, and measurable functions and their properties on R and Rn.
- To let the students to gain own insight on properties of Lebesgue integral with proof development and extend the concept to Lp spaces
- To enable the students to explain relationship and differences of Lebesgue integral and Riemann integral.

Specific objectives and Course Contents

Specific objectives	Contents
• To define metric (distance function) and metric space with examples. • To prove the properties of open and closed sets on metric space. • To establish relationship among open and closed sets with limit points, interior and closure. • To define continuous function and prove its properties on metric spaces	**Unit 1: Metric Space (5)** 1.1 Definition of metric space with some elaboration of examples 1.2 Open ball, open sets, closed sets and their properties 1.3 Interior, limit, closure and boundary with their relationships 1.4 Continuous functions and its properties 1.5 Equivalence and complete metric spaces
• To define topological space and construct topologies of finite set. • To establish the properties of open and closed sets, interior, boundary and closure • To explain the concept of basis and sub-basis with proof of related theorems.	**Unit 2: Topological Spaces (7)** 2.1 Definition and Examples 2.2 properties on open and closed sets, interior, closure and boundary 2.3 Basis and sub-basis 2.4 continuity and topological equivalences 2.5 subspace topology

Specific objectives	Contents
• To analyze the equivalence, continuity properties and subspace topology.	
• To differentiate connected and disconnected spaces with their property • To prove theorems on connectedness and able draw their application • To explain properties of path and locally connected spaces.	Unit 3: **Connected space (4)** 3.1 Connected and Disconnected spaces 3.2 Theorems on connectedness 3.3 connected subsets on **R** 3.4 Path and locally connected spaces
• To define compact space and establish finite intersection property. • To establish relationship between continuity and compactness properties. • To analyze compactness properties and locally compact spaces.	**Unit 4: Compact Spaces and subspaces (4)** 4.1Definition, examples finite intersection property 4.2 compactness and continuity 4.3 properties on compactness 4.4 Locally compact
• To define Lebesgue outer measure, measurable sets, and functions with example on **R.** • To prove the properties of outer measure, measurable sets and functions on	**Unit 5 Lebsuge Measure on real line R (5)** 5.1 Lebesgue outer measure 5.2 Measurable sets 5.3 Measurable functions
• To define points, sets and volume of interval on Rn • To extend the ideas of Lebesgue outer measure, measurable sets in Rn • To prove the properties of Lebesgue measure and Caratheodory theorem.	**Unit 6 Lebesgue Measure on R^n (6 hrs)** 6.1 points, sets, and volume of interval on R^n 6.2 Lebesgue Outer Measure and its properties 6.3 Measurable sets 6.4 Properties of Lebesgue Measure 6.5 Caratheodory theorem
• To define measurable functions and establish its properties with extension of concepts from unit 5. • To prove Egorov's theorem • To analyze convergence properties from measure perspective.	**Unit 7: Measurable Functions (5 hrs)** 7.1 Measurable functions and its properties 7.2 Egorov's theorem 7.3 convergence in measure
• To define the Lebesgue integral and prove its properties • To prove monotone convergence theorem, Fatou's lemma and dominated convergence theorems. • To analyze similarities and differences between Lebesgue and Riemann integrals.	**Unit 8 Lebesgue Integrals (8 hrs)** 8. 1 Integral of non negative functions 8.2 Properties on integrals of nonnegative functions 8.3 Integrals of arbitrary functions 8.4 Properties on integrals of arbitrary functions 8.5 Relation of Lebesgue and Riemann integrals

Specific objectives	Contents
• To explain L^p and l^p spaces • To establishYoung's inequality; Holder's and Minkowski's Inequalities in L^p & l^p classes • To establish properties of Banach and metric spaces.	**Unit 9 L^p spaces (4 hrs)** 9.1 L^p and l^p classes 9.2 Young's, Holder's and Minkowski's Inequalities in L^p & l^p classes 9.3 Banach and Metric space properties

Instructional techniques

The collaborations between teacher and students in teaching and learning process, is the main instructional technique to acquire the objectives of this course. The group works and individual works of students may be equally emphasized in classroom activities. The some common instructional techniques for all units may be as follows:

- Provide reading materials such as units of books, lecture notes, specific web-pages before starting the lesson.
- Extensive lecture and presentation with question- answer
- Discussion on small groups
- Project works and presentations of students
- Home assignment and discussion with feedback.

Evaluation and assessment

The evaluation basis of this course will be both internal assessment conducted by course teacher and external examination at the end of the semester.

Internal and external evaluation scheme

Internal Evaluation (40%)		**External evaluation (60%)**	
Attendance	5 marks	Objective types questions/ multiple choices (10 questions × 1 mark)	10 marks
Participation in classroom activities	5 marks		
First assignment (written test)	10 marks	Short answer questions (6 questions × 5 marks)	30 marks
Second assignment (project work with presentation)	10 marks		
Third assignment (home assignment/ exam	10 marks	Long answer questions (2 question × 10 marks)	20 marks
Total	40 marks	Total	60 marks

Recommended Books

Barra, G. (1981). *Measure theory and integration*.New Delhi: New Age International Publishers

Croom, F. H. (1989). *Principles of topology*.Orlando: Sunders College Publishing

Wheeden, R. L & Zygmund, A. (1977). *Measure and integral*. New York: Marcel Dekker Inc.

References

Jain, P. K. & Gupta, V. P.(1993). *Lebesgue measure and integration*, New Delhi:…

Munkres, J. R. (2010). *Topology*. New Delhi: PHI Learning Private limited

Royden, H. L. & Fitzpatrick, P. M. (2012). *Real analysis*. New Delhi: PHI Learning Private Limited

Rudin, W. (1987). *Real and complex analysis*. New Delhi: McGraw Hill Education Private limited

Course Title: **Student teaching On-campus**

Nature of course: Practical — Credit: 3 hrs

Level: M.Ed. — Teaching duration: 3 weeks

Course No: Math Ed 541 — Semester: Fourth

1. Course Introduction

On Campus teaching experience is an essential component of student teaching. It grants an opportunity to practice the most of skills required for off-campus teaching for a minimum duration of 3 weeks. The goal of the on-campus program is to prepare student-teachers for designing and delivering student centered activities for teaching with the help of peer feedback sessions. It also provides opportunity to overcome the doubts about their ability to cope with unfamiliar situation, controlling and managing students' classroom behavior.

2. Course Objectives

Upon completion of the course student-teacher will be able to:-

1. Learn to develop rapport with co-operating campus/college families.
2. List out the major educational, administrative, physical and economic aspect of college prior to micro-teaching.
3. Able to prepare the report of reflection based on college visit, and conduct a seminar to share the college visits and experience.
4. Demonstrate knowledge and understanding of the essentials of teaching, learning and assessment.
5. Learn new methods of teaching and making a good lesson plan.
6. Demonstrate knowledge, understanding, and skills required for designing lesson objectives, analyzing, evaluating and investigating teaching techniques or experience.
7. Demonstrate and adapt lesson plan based on peer feedback.ing, confirming, checking, summarizing, encouraging, compromising, handling objections and dealing with difficulties.
8. Recognize the style and elements of a lesson plan in collaboration with peer in both large and small groups using the group process techniques of listening, clarify
9. Deliver teaching for an hour that shows the process of his/her learning through the class topics and peer feedback sessions.
10. Demonstrate the techniques for giving and receiving constructive feedback.

3. Course Content

There are four main components of on-campus program. They are as follows:

1. Field observation and reporting
2. Preparation of lesson plan
3. Preparation of teaching and learning materials
4. Micro-teaching

4. Activities

Field observation and conducting seminar

Each student will be assigned a college/campus and an internal supervisor at the beginning of the 4th semester. The student will visit the college/campus, build a rapport with the curriculum teacher, discuss the learning issues in the classroom

and observe some of the lessons in the class. The observation will focus on the key areas of pedagogy, classroom management, lesson sequence, activities, student's engagement patterns of classroom interaction etc. Prior to the college/campus visit, the supervisor and the students will prepare an observation form and the students will be given due orientation at the campus on what to observe, how to observe and how to keep the record of what was observed in the class. Each student will observe at least five lessons in a certain interval and prepare a report for a class seminar. The seminar will discuss the issues observed in college/campus and the students will draw implicative lessons from the discussion for their practice teaching. After the class seminar the students will submit an individual report of their observation along with their critical reflections in about 1000-1500 words.

Preparation of Lesson Plan

The students will prepare 10 lesson plans from different areas of curriculum and evaluation teaching based on different learning theories. Some of them may be prepared on behaviorist approach, some of them may follow cognitive approach and other may follow constructivist approach. The supervisor will review the lesson plans and provide his/her feedback for their improvement before the students submit them for final grading. The grading of the lesson plan will be made based on the criteria such as the format of the lesson, learning goals, activities and lesson sequence.

Preparation of teaching and earning Materials

A weeklong materials preparation workshop will be organized in on-campus and the students will prepare all the required materials for their real classroom teaching. Flash cards, posters, work-sheets, activities, audio recording, collection of pictures, drawing etc will be prepared during the workshop. The supervisor will review the materials and sign them.

Micro-teaching

Students will teach five to ten micro-lessons during their supervised micro-teaching. All the micro-teaching sessions will be observed by the supervisor and necessary feedback will be provided to the students. After the micro-teaching post observation seminar will be organized in order to share he reflection of the students and the feedback of the supervisor and peers. Some of the micro-taught classes will also be videotaped and the students will be asked to make comments on their own classes.

5. Evaluation scheme

1. Field observation and conducting seminars	20 marks
2. Preparation of Lesson Plan	20 marks
3. Preparation of teaching and earning Materials	20 marks
4. Micro-teaching	40 marks

6. Prescribed Texts

Cohen, L; Manion,L; & Morrison, K. (2008). *A guide to teaching practice*. Oxon: Routledge.

Richards, J. C.; & Farrell, T. S.C. (011). *Practice teaching: a reflective approach.* Cambridge: Cambridge University Press.

Course Title: **Student teaching Off-campus**

Nature of course: Practical	Credit: 6 hrs
Level: M.Ed.	Teaching duration: 10 weeks
Course No: Math Ed 542	Semester: Fourth

1. Course Introduction

Off campus teaching experience is an important component for becoming a teacher. It grants student-teacher experience in the actual teaching and learning environment. During teaching practice (ten weeks) a student-teacher is given the opportunity to try the art of teaching before actually getting into the real world of teaching profession. Student-teacher should experience the excitement of being a part of a real classroom setting, of getting to known learner, of planning and organizing the classroom tasks and establishing a working relationship with supervisor.

2. Course Objectives

The objectives of the course are as follows:

1. To give students real teaching experience in college/campus.
2. To expose students to the college/campus environment so that they learn the college/campus culture.
3. To train them engaged into a real teaching-learning environment and in other extra-curricular activities.

3. Course Content

1. Actual teaching
2. Case-study/curriculum Analysis
3. Teaching logbook and test item construction
4. Extra-curriculum activities

4. Activities

Actual teaching

Each student will be required to teach minimum of 30 lessons, not exceeding one lesson per day. The students will prepare daily lesson plan and all the necessary teaching learning materials along with the work-sheets in close coordination with the college/Campus teacher and their internal supervisor in advance and deliver the lesson in college/campus. Out of thirty, at least seven lessons must be observed by the campus supervisor in different time intervals.

Case-study/curriculum Analysis

The students will identify a particular case or curriculum for a detailed study. The case could be a student with a unique learning style, a teacher who has been will recognized for his/her lessons, a group of students with a different evaluation system needs, a group of students with an indigenous community or a student wit a different ability. The case should be studied in detail and a report of about 2000 words would be produced and submitted to the campus supervisor.

The curriculum analysis unpacks a curriculum into its component parts: Learning, teaching, knowledge, society, resources etc. It checks underlying beliefs and assumptions. It can be done in different formats: Content Analysis, Input-process-output analysis etc. The reasons for doing curriculum analysis are

1. To make an assessment of the curriculum in order to improve it.
2. To identify potential and actual problem as early as possible and recommend possible solutions.
3. To make decisions about future support for continuation.
4. To identify strengths and weakness of curriculum to make it better.
5. To determine whether the goals have been met.
6. To examine whether assumptions underlying the curriculum are valid.

Preparing logbook for teaching and construction of test items

Students will be required to maintain a log book of their teaching every day. The logbook should record the class, the subject they teach and the main activities they carried out. Similarly, students will also prepare test items from the course they teach in the college/campus. The test items will include at least 20 objectives question and ten subjective questions of various types.

Extra-curriculum activities

Students should organize at least one extra-curricular event in the college/campus and a report of the event should be submitted to the campus supervisor.

5. Evaluation scheme

1.	Classroom teaching	50 marks
2.	Case study/Curriculum Analysis	15 marks
3.	Logbook Record	10 marks
4.	Test Items construction	10 marks
5.	Extra-curriculum activities even report	15 marks

6. Prescribed Texts

Cohen, L; Manion,L; & Morrison, K. (2008). *A guide to teaching practice*. Oxon: Routledge.

Richards, J. C.; & Farrell, T. S.C. (011). *Practice teaching: a reflective approach.* Cambridge: Cambridge University Press.

Course Title: **Thesis**

Nature of course: Practical	Credit: 12 hrs
Level: M.Ed.	Teaching duration: One semester
Course No: Math Ed 543	Semester: Fourth

1. Course Introduction

This course has 12 credits with two major components: pre-thesis work and carrying out the research and thesis writing each carrying 3 and 9 credits respectively. The pre-thesis work consists of a review of related literature in the area of the students' choice and preparing a manuscript in a standardized article format surrounding the issues s/he has chosen. The aim of this task is to acquaint the students with the related issues in the field and develop their skills in the areas of academic writing, analysis and critical thinking.

2. Course Objectives

The course aims to accomplish the following objectives:

1. To help students search and review relevant literatures and write a manuscript in a standardized article format.
2. To develop competencies in identifying and defining research problems, preparing data collection instruments and collecting and analyzing the data.
3. To enable students to use the findings of research in thesis writing.
4. To help student prepare a research report in APA format.

3. Course Content

Thesis writing course has two main components given below:

1. Pre-thesis Task (3 credits)
2. Thesis work (9 credits)

4. Activities

Pre-thesis Task (3 credits)

Under the supervision of the thesis guide, the students will undertake the following activities:

1. Collection of relevant materials (at least 5 theoretical and 5 empirical articles)
2. Review and critical analysis of each article (at least 500 words for each)
3. Writing an article synthesizing the review and seeking publication in a journal.

Thesis work (9 credits)

Thesis work will be conducted in the following stages:

1. The Department Research Committee (DRC) will seek thesis proposal from the students and designate the supervisor.
2. Under the guidance of the supervisor, the students will finalize the proposals and submit to the DRC for final evaluation.
3. The DRC interviews the students and provides feedback for the amendments.
4. The student undertakes the study under the guidance of the supervisor.
5. The students finalize the writing and submit 3 copies of draft report to the concerned department.

6. The DRC, in addition to an external examiner, interviews students and assess the overall quality of thesis.

5. Evaluation scheme

Pre-thesis task:

1.	Collection of theoretical and empirical literatures	05 marks
2.	Review and critical analysis	30 marks
3.	Writing an article for publication	10 marks

Thesis work:

The thesis will be evaluated on the basis of its quality under following headings:

1.	Quality of research Title	05 marks
2.	Appropriateness of methods and quality of instruments	10 marks
3.	Clarity of conceptual/theoretical framework and or literature review	25 marks
4.	Appropriateness of presentation and analysis of result	15 marks
5.	Appropriateness of conclusions and suggestions	10 marks
6.	Overall organization of the report (format, use of references and bibliography)	10 marks
7.	Contribution of the study to related theory and practice	10 marks
8.	Oral presentation	
	Presentation of research work	50 marks
	Accuracy, fluency, and clarity of presentation	15 marks
		150 marks

6. Prescribed Texts

Best, J. W. & Kahn (2006). *Research in education (10th ed.).* New Delhi: Prentice Hall of India.

Clements, M. A; & Ellerton, N. F. (1996). Mathematics education research: past, present and future.

Cohen, L.; Manion, L. & Morrison, K. (2007). *Research methods in education (6th ed.)* London: Routledge.

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Format for the thesis

The thesis should be prepared as per the format supplied by the Department of Mathematics Education. A suggested format will be as follows:

Pretext information
- Title page
- Copyright page (optional)
- Abstract
- Dedication (Optional)
- Acknowledgement
- Table of content
- List of table and figures

Chapter I: Introduction
- Background or The context
- Statement of the problem
- Significance of the study
- Objectives of the study
- Hypothesis/Research questions of the study
- Delimitation of the study
- Operational definitions of terms

Chapter II: Reviews of the Literatures
- Review of theoretical literatures
- Review of Empirical literatures
- Theoretical/conceptual framework

Chapter III: Methods and Procedures
- Research Design
- Population/sampling
- Instrumentation
- Data collection and analysis procedures

Chapter IV: Analysis and Interpretation

Chapter V: Discussion
- Finding
- Conclusion
- Implication
- Suggestion
- Recommendations

References

Appendices/Annexes

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Note: Pre-requisite for the course: The students must complete all course assignments and exams of semester I and II before undertaking the thesis work. Final oral examination of the thesis will be conducted only after passing all the courses offered in III and IV semester.