Far western University
Faculty of Education

M.Ed. in Mathematics

Far western University
Faculty of Education
M.Ed. in Mathematics

Course Code	Course Title	Credit
Semester I		
Math.Ed. 511	Abstract Algebra	3
Math.Ed. 512	Mathematical Analysis	3
Math. Ed. 513	Mathematical Statistics	3
Semester II		
Math.Ed. 521	Mathematics Education	3
Math.Ed. 522	Differential Geometry	3
Math.Ed. 523	Linear Algebra	3
Math.Ed. 524	Topology	3
Math.Ed. 525	History of Mathematics	3
Semester III		
Math.Ed. 531	Research Methods in Mathematics Education	3
Math.Ed. 532	Projective Geometry	3
Math.Ed. 533	Special Function	3
Math.Ed. 534	Operation Research	3
Math.Ed. 535	Computer Science in Mathematics Education	3
Semester IV		
Math.Ed. 541	Complex Analysis	3
Math.Ed. 542	Trends and Assessment in Mathematics Education	3
Math.Ed. 543	Teaching Practice	3
Math.Ed. 544	Thesis	6

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Course Title: Abstract Algebra

Course No. : Math. Ed. 511 Level: M Ed
Semester: First Credit Hours: 3
Total Hours: 48

1. Course Introduction

This course deals abstract algebra course with associated concepts, theorems and problems with a focus on conceptual knowledge of algebra. This course covers various structure theories of groups, factorizing integral domain and the extension up to Euclidean domain, field extension, basic module concept and rings with chain condition.

The course is design to demonstrate similar kind of structure property in a unit so that students can get an idea of commonalities and differences between them. It is envisaged that this course enables students to experience the practical and aesthetic dimensionsof recent field of study in mathematics.

2. General Objectives

General objectives of this course are as follows:

1. To promote problem-solving and critical thinking skills through the application of algebraic concepts to common situations
2. To appreciate the use of abstract algebra in developing advanced mathematicalthinking
3. To develop conceptual understanding of some advanced contents of groups, rings, field and their applications
4. To develop basic understanding of Module theory.
5. To make students able to solve problems related to the assigned contents and usethe significances of theorems
6. To help students develop and refine algebra skills by way of an integrated review ofthese skills as they are needed in the course.

3. Contents in Detail with Specific Objectives

Specific Objectives	Contents
• A brief review of theory of groups • Bring concepts of Cartesian products into group theory applications as direct products and direct sums • To define p-sylow subgroup with examples, State and prove	**Unit 1: Structure theorems of Groups (8)** Brief review of Groups – Subgroups, Cyclic groups, Cosets, Permutation groups, Normal subgroups, Group homomorphism and isomorphism theorems Direct Products and direct sums – External andinternal direct products and sums The Sylow theorems - Definition of p-sylow

sylow's theorems, to deal the problem with the applications of sylow's theorem. • To bring the concept of finitely generated abelian group, state and prove the fundamental theorem of finitely generated abelian group, State and prove the theorems associated with invariants of finite abelian group and illustration of the theorems with examples	subgroup Sylow's first, second and third theorem, Some applications of sylow's theorem 1.4 Finitely generated abelian groups – Fundamental theorem, Invariants of a finite abelian group and associated theorems, applicable problem based on thistheorem
• To motivate for the definition of a group generated by a subset, State and prove of the associatedtheorems • To familiarize the sequence of subgroups in terms of subnormal series and normal series. Extension of these series to solvable group. • Proof of Sn not solvable for n □ 5. • State and proof of Zassenhaus and Schreier's theorems for the concept of Jordan Holder theorems for finite groups	**Unit 2: Solvable groups and Jordan Holder theorem(9)** Generators of a subgroup and derived subgroups Subnormal series, Normal series and extension ofthese concepts to Solvable groups Solvability theorems for subgroups and normalsubgroups, solvability of S_n Zassenhaus theorem, Schreier's refinementtheorems Composition series and Jordan Holder theorem forfinite groups
• Review of basic properties of rings and integral domain • To discuss units, irreducible to bring the concept for unique factorization domain, Illustration with examples • To Motivate for the definition of PID and ED • To state and prove the relationship between these threedomains • Use the concepts of these domains for some applicable	**Unit 3: Unique factorization domain, Principal idealdomain, Euclidean domain (9)** Review of basic properties of Rings, Review ofintegral domain and associated theorems. Units, irreducible, associates, Equivalenttheorems for associates in an integral domain Unique factorization domain (UFD) Principal ideal domain (PID) Eulidean domain (ED) Relations between these three domains Applications of these domains, for example, likesolution of $x^2 + 2 = y^3$ with x and y integers

problems	
• To explain the definition of extension field and finite extension field illustrating with examples • To state and prove minimal polynomial theorem and illustrate the theorem with examples. • More theorems related to extension field. • To discuss for the concept for irreducible polynomial and state and prove of Einstein criterion forirreducibility • To deal Algebraic extensions with supporting theorems, and Examples	**Unit 4: Field Extension (8)** Definition of extension field, finite extension, degree of extension field, minimal polynomial of degree n Minimal polynomial theorem with degree of extension field Degree related to subfields theorem Irreducible polynomials and Eisenstein criterion, Properties of F[x], Illustration with examples Algebraic extension, associated theorems, Illustration the extension with examples.
• To define and explain left R module and right r-module • State and prove module generated by a set • State and prove the theorems related to module homomorphism and quotientmodules.	**Unit 5: Modules (6)** 5.1. Review of vector space, definition of left R-modulesand right R-module 5.2 Elementary properties of modules and examples 5.2. Submodules, Submodule test and examples. cyclic module, module generated by a set. Direct sums 5.3. R-homomorphism and quotient modules
• To explain the difference between Two chain condition • To State and prove equivalent theorems and quotient ring to beNoetherian and Artinian. • To illustrate the difference with examples and counter-examples.	**Unit 6: Rings with chain conditions (8)** Definition of Noetherian rings and Examples Equivalent theorem of Noetherian ring,Theorem for quotient ring to be Noetherian 6.3 Definition of Artinian rings and examples 6.3. Equivalent theorem for Artinian rings, theorems forquotient ring to be Artinian. 6.4 Some more examples and counter examples.

4. Methodology and Techniques*Modes of instruction:*

- Lecture
- Seminar

- Exercises
- Guided study
- Tutorial
- Independent study
- Project work

Modes of learning:

- Attending lectures,
- Doing assignments,
- Writing papers,
- Independent and private study,
- Reading books, reviewing journals and papers,
- Critiquing
- Group study
- Peer discussion

5. Evaluation Scheme

- Internal 40%
- External 60%

The internal examination will be conducted as follow:

a) Regularity and class participation 5%
b) Quizzes: 3 5%
c) Class presentation: 1 20%
d) Term paper/assignment: 1 20%
e) Mid-term Exam 20%
f) Investigative Project Work: 1 20%
g) Group Work and Pair Work/Group Project: 1 10%

6. References

a) P B Bhattacharya, S K Jain and S R Nagpaul (1995). Basic Abstract Algebra (2nd edition), Cambridge University Press
b) Surjeet Singh & Qazi Zameeruddin. (2012). Modern algebra (8th edition). Vikash Publishing house Pvt Ltd. India
c) I N Herstein. (2006). Topics in algebra (2nd edition). Second edition, Wiley India Pvt. Ltd
d) J B Fraleigh (2003). A first course in abstract algebra (7th edition). Pearson Education
e) Joseph A Gallian (1999). Contemporary Abstract Algebra. Narosa publishing house,India.
f) W L Gilbert (2008) . Modern algebra with applications: Wiley student edition
g) Dummit , D. S. & Foote, R. (2003). Abstract algebra (3rd edition). New Delhi: Wiley

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Course title: Mathematical Analysis **Semester**: First

Course No: Math. Ed. 512 **Credits**: 3

Total periods: 45 **Time per period**: 1 Hour

1. **Course Introduction:** This course is especially designed for master's student to understand the concept and techniques ofmathematical analysis and their use in problem solving. The course begins with the review of set topology of real number, sequence and series, concepts of limit, continuity of functions. The course focuses in Lebesgue measurable sets and Lebesgue measurable functions and then uses these to define Lebesgue integrals. Course all focuses on L^p-spaces and general Metric spaces.

2. **Course Objectives**: The objectives of this course are as follows:

a) To review the fundamental concepts of sets of real numbers, sequences and series and limits and continuity of functions
in real line.

b) To acquaint with the Lebesgue measure and understand their various properties.

c) To explore the use of Lebesgue measure to define the Lebesgue measurable functions and their properties.

d) To study the use of Lebesgue measurable functions to define Lebesgue integral and understand their properties.

e) To identify the differentiation and integration of monotonic functions and learn their properties.

f) To explain L^p-spaces with examples and understand their properties.

g) To exemplify the metric spaces with examples and understand the concept of convergence, divergence and Cauchysequences.

3. **C ontent in details with specific objectives**

Specific Objectives	Contents
• To review the basics about the realnumber system. • To exemplify various sets in Rand their properties • To acquaint with real valuedfunctions with examples • To review the sequence and series • To recall the limit and continuityof functions on R.	**Unit 1: Real Number System and Calculus (6 Hours)** The real number system Different types of sets in R Real valued functions Sequence and series Limit , Continuity of real valued functions

• To find out the basices needed todefine the Lebesgue measure. • To define the Lebesgue outer measure and Lebesgue measurablesets. • To acquaint with the sigma-algebra of Lebesgue measurablesets. • To identify the properties ofapproximation • To explore the meaning of the Cantor set and Cantor Lebesgue function,	**Unit 2: Lebesgue Measure (7 Hours)** Algebra and sigma algebra of sets Lebesgue outer measure, Lebesgue measurable sets The sigma-algebra of Lebesgue measurable sets Inner and outer approximation of Lebesgue measurablesets. Cantor set and Cantor Lebesgue function
• To use Lebesgue measure to defineLebesgue measurable functions. • To list the properties ofmeasurable functions • To explain the meaning of thesequential pointwise limits • To discuss and use Littlewood'sthree principles in relevant problems	**Unit 3: Lebesgue measurable functions (6 Hours)** Lebesgue measurable functions Sum, product and composition of Lebesgue measurablefunctions Sequential pointwise Limits Littlewood's three principles (statement only)
• To acquaint with the Lebesgueintegral of non-negative functions • To make a list of the propertiesof Lebesgue integral • To explain the most generalLebesgue integral • To explain the uses of LebesgueAlmost Everywhere in functions.	**Unit 4: Lebesgue Integration (7 Hours)** Lebesgue integral of non-negative functions Convergence properties of the Lebesgue integral The general Lebesgue integral Lebesgue Almost everywhere
• To define the continuity ofmonotone functions • To define the differentiability ofmonotone functions • To exemplify the functions ofbounded variations • To define the absolutelycontinuous functions • To define convex functions	**Unit 5: Differentiation and Integration (8 Hours)** Continuity of monotone functions Differentiability of monotone functions Functions of bounded variations Absolutely continuous functions Convex functions

• To acquaint with L^p-spaces • To explain the inequalities of Young, Holder and Minkowskiand their applications • To exemplify the completenessproperties of L^p spaces.	**Unit 6: L^p-Spaces (6 Hours)** Normed linear spaces The L^p-Spaces Inequalities of Young, Holder, and Minkowski : L^p is complete.
• To define metric spaces and the concept of different point sets in it. • To define the concept of convergence, divergence and Cauchysequence in metric spaces. • To explain the basics of normed andBanach spaces.	**Unit 7 Metric Space (5 Hours)** Definition of metric and metric space, examples Concept of open sets, closed and neighborhood in ametric space Continuous mapping, convergence and Cauchysequences and completeness.

4. **Methodology and Techniques**: The teaching faculty members are expected to help students to learn the contents, prove much needed theorems, discuss the application of these theorems in solving various related problems. More focus should begiven to the independent work of students and encourage them for critical thinking. Faculties are advised to encourage students to learn mathematical softwares, like Latex, matlab etc. and assign some project works related to it.

5. **Evaluation Scheme**

Internal (40 marks)

a) Homework and quizzes $(4 \times 5 = 20)$
b) In class exams $(2 \times 5 = 10)$
c) In class presentation (5)
d) Take home projects (5)

External (60 marks)- SEMESTER FINAL EXAMINATION

Note: Please suggest the format of final examination, in class exams and requirements of presentation to your students indetails.

6. **References:**

1. **Introductory Functional Analysis with Applications (2012)** by Erwin Kreyszig, Wiley India.
2. **A Course in Real Analysis** by John N. Mcdonald and Neil A. Weiss (2010), Second Edition, Elsevier, India.
3. **Principles of Real Analysis** by Santosh Man Maskey (2007), Ratna Pustak Bhandar, Kathmandu, Nepal**.**
4. **Real Analysis** by H.L. Royden and P.M. Fitzparick (2005), Fourth edition, PHI, India.
5. **Real and Complex Analysis** by Walter Rudin (2000), Third edition, Mcgraw-Hill international.

Far-western University
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M.Ed. in Mathematics

Course Title: Mathematical Statistics

Course No.: Math.Ed. 513 Level: M Ed
Semester: First

Credit Hours: 3

1. Course Introduction

The main aim of this course is to bring probabilistic and inferential statistical ideas in the field of teaching, applied mathematics, and educational research through problem solving approach. All areas of science, including educational research, involved with the quantitative study of real phenomena involve the application of three distinct disciplines: data analysis, probability, and statistical inference. This course acquaints the graduate students with the fundamental understanding of each of these three disciplines, with the intent of enabling the student to perform fundamental data displays, analyses, and interpretations of univariate and bivariate statistics. Coincident with the acquisition of the ability to perform these tasks is the acquisition of the ability to interpret and critique the application of statistical techniques by other researchers in scientific publications. The laboratory portion of this course is meant to provide the student with a working knowledge of Statistical Package for the Social Sciences (SPSS).

2. General Objectives

General objectives of this course are as follows:

a) To develop a conceptual understanding of probability and probability distribution
b) To appreciate and use the role of probability distribution in modeling random phenomenon
c) To develop a conceptual understanding of statistics and its role in moderninterdisciplinary research
   - To perform statistical analysis using data sets and SPSS software including the Measures of central tendency and variability and graphic displays (e.g., histograms, scatter plots etc.)
d) To test hypothesis using parametric and non parametric test

3. Contents with Specific Objectives

Specific Objectives	Contents
• To define probability in differentapproaches • To prove theorems of conditional probability	**Unit One: Basic Probability (5)** 1.1 Definition of probabilities in different approaches (Classical Probability, Empirical Probability) with examples

• To state, prove and apply Bayes'theorem • To apply permutation and combination in probabilities	Conditional probability and problems related to the theorem Bayes' theorem, its prove and problems related to the theorem Practical Problems related to combination
• To define random variables (discrete and continuous) with examples • To discuss discrete probability distribution and continuous probability distribution with examples • To discuss distribution function for random variables (discrete and continuous) • To define mathematical expectation of a random variable and theorems related to mathematical expectations and variance	**Unit Two: Random Variables, Probability Distribution and Mathematical Expectation (6)** 2.1.Random variables Discrete probability distribution and continuous probability distribution Probability distribution function and Probability density function Mathematical Expectation and variance
• To explain about binomial distribution, its important; to state and prove binomial distribution theorem and its mean and variance, to solve related problems • To explain about Poisson distribution as a limiting case of binomial distribution, its important; to state and prove poisson distribution theorem and its mean and variance, to solve related problems • To explain about Normal distribution, its important; to state the equation of Normal Probability Curve, to describe Standard Normal Distribution and state the properties of normal distribution, to solve related problems	**Unit Three: Special Probability Distribution (8)** Binomial Distribution • State and prove • Mean and variance • Related problems Poisson Distribution (As a limiting case of Binomial Distribution) • State and prove • Mean and variance • Related problems Normal Distribution • Normal Probability Curve • Standard Normal Distribution • Properties of Normal Distribution • Related problems Hyper geometric Distribution • Hyper geometric Distribution Function • Mean and variance • Related problems

• To explain about Hyper geometric Distribution, its important, to state mean and variance and to solve related problems	
• To define population and sample, sampling techniques and distribution of sample • To state central limit theorem and it's use • To estimate using point and interval estimation techniques • To be aware about confident interval in various cases	**Unit Four: Sampling, Sampling Distribution and Estimation [6)** Population and sample [very basic ideas], Techniques of sampling, distribution of sample mean ($\bar{X}$) Central Limit Theorem, use of central limit theorem, Standard Error and sampling distribution Estimation-point and interval, properties of good estimator, unbiased estimates of the population mean and variance from a sample Confidence interval, calculating confidence interval, Different levels of confidence, confidence interval for a large sample
• To know the meaning of Hypothesis, to develop the good hypothesis, to apply various tests of Hypothesis	**Unit Five: Statistical Inference- Test of Hypothesis (10)** 5.1. Introduction, Meaning of hypothesis, Characteristics of good hypothesis, Type I and Type II Errors One tailed and Two tailed Test, Power of Test, Elements of a Statistical Test, Testing a Statistical Hypothesis, P-value, Test Concerning Means, Test Concerning Difference Between Means, Test Concerning Variance, Large Sample Test of Variance Test Concerning Ratio of Two Variance, Test Concerning Proportions, Test Concerning the Difference Between Two Proportion
• To use one way and two ways ANOVA	**Unit Six: Analysis of Variance: (6)** 6.1. Introduction, Assumptions in the Analysis of Variance, Steps in Analysis of Variance, Techniques of Analysis of Variance One-Way Analysis of Variance, One- Way Analysis of Variance with Different Sample Sizes Two-Way Analysis of Variance

• To use various Non parametric test (The sign Test, The sign-rank test, The U-test and H-Test)	**Unit Seven: Non-Parametric Test (5)** 7.1. Parametric and Non-Parametric Test, The Sign Test, The Sign-Rank Test Rank-Sum Test: The U-Test Kruskal Wallis H Test

4. Methodology and Techniques*Modes of instruction:*

- Lecture
- Seminar
- Exercises
- Guided study
- Tutorial
- Independent study
- Project work

Modes of learning:

- Attending lectures,
- Doing assignments,
- Writing papers,
- Independent and private study,
- Reading books, reviewing journals and papers,
- Critiquing
- Group study
- Peer discussion

5. Evaluation Scheme

- Internal 40%
- External 60%

The internal examination will be conducted as follow:

a) Regularity and class participation 5%
b) Quizzes: 3 5%
c) Class presentation: 1 20%
d) Term paper/assignment: 1 20%
e) Mid-term Exam 20%
f) Investigative Project Work: 1 20%
g) Group Work and Pair Work/Group Project: 1 10%

6. References

a) John E. Freund's. *Mathematical Statistics with Application* [2009, 7th Ed, PearsonEducation]

b) Gupta S. C. *Fundamental of Statistics;* New Delhi: Himalaya Publishing House, India, 2006.

c) Gupta S. P. *Statistical Method;* New Delhi: S. Chand and Sons Publishers, India2007.

d) David Stirzakar. *Probability and Random Variables, A Beginner's Guide;* Cambridge University Press, 1999.

e) Sheldon M. Ross. *Introduction to Probability Model*; Academic Press, 1997.

f) Levin R. I. and Rubin D. S.; *Statistics for Management* [7th Ed.] Prentice Hall. NewDelhi, India.

g) Ajai S. Gaur, Sanjay S. Gaur; *Statistical Methods for Practice and Research: A Guide to Data Analysis Using SPSS,* 2nd ed, 2011. SAGE Publication Inc (Response Books), New Delhi, India.

Far-western University
Faculty of Education
M.Ed. in Mathematics
Mathematics Education

Course Title: **Mathematics Education** Full Marks: 100
Course No: Math. Ed. 521 Pass Marks: 50
Nature of Course: Theoretical Teaching Hours: 45
Level: Masters
Semester: 2nd

1. Course Description

This course is designed for post graduate students to develop the understanding of mathematics education. It consists the nature of mathematics and mathematics education, theories of learning, instructional strategies, teaching to exceptional students and issue on mathematics education. The course describes mathematics from educational point of view. The course focuses on application of skills of mathematics education.

2. General Objectives

Broadly, the course has following objectives

- To explore nature of mathematics and mathematics education through various perspectives.
- To develop a deeper understanding of theories of learning mathematics and their implication.
- To make students familiar with instructional strategies and use them in mathematics teaching.
- To develop skills of teaching mathematics to exceptional students.
- To discuss on different issues on mathematics education.

3. Specific objectives and contents

Specific Objectives	Contents
• To explain meaning of mathematics from different point of view. • To collect and explain definitions of mathematics • To explain different views on nature of mathematics. • To explain dialogical nature of mathematics. • To explain cultural nature of mathematics. • To compare different philosophies of mathematics. • To explain main theme of different	**Unit I: Nature of Mathematics (9)** 1.1 Meaning and definition of mathematics 1.2 Views on nature of mathematics • Absolutist's view • Fallibilistic's view • Platonist's view 1.3 Dialogical nature of mathematics 1.4 cultural nature of mathematics 1.5 Philosophy of mathematics: Formalism, Logicism, Intuitionism and constructivism.

philosophies of mathematics.	
• To describe brief history of mathematics education. • To explain relationship between mathematics and mathematics education. • To explain nature and aims of mathematics education. • To explain different foundations of mathematics education • To explain primary and secondary elements of mathematics education. • To describe philosophy of mathematics education	**Unit II: Nature of Mathematics Education (7)** 2.1 Brief history of mathematics education 2.2 Relationship between mathematics and mathematics education 2.3Nature and aims of mathematics education 2.4 Foundation of mathematics education • Mathematical foundation • Psychological foundation • Philosophical foundation • Sociological foundation 2.5 Primary and secondary elements of mathematics education 2.6 Philosophy of mathematics education
• To give introduction to learning theory • To discuss with illustrations the main features of Ausubel's theory of learning and its implication. • To discuss with illustrations the main features of Bruner's theory of learning and its implication. • To discuss with illustrations the main features of Diene's theory of learning and its implication. • To discuss with illustrations the main features of Gagne's theory of learning and its implication. • To discuss with illustrations the main features of Skemp's theory of learning and its implication.	**Unit III: Theory of Learning (10)** 3.1 introduction of learning theory 3.2 Ausubel's theory of learning 3.2.1Preconditions for meaningful reception learning 3.2.2 Strategies for meaningful verbal learning 3.2.4 Implications of Ausubel's theory in teaching/learning mathematics 3.3 Bruner's theory of learning 3.3.1 Six characteristics of intellectual growth 3.3.2 Theorems on learning mathematics 3.3.3 Implication of Bruner's theory in teaching/learning mathematics 3.4 Diene'stheory of learning 3.4.1 Mathematical concepts 3.4.2 Stages on learning mathematical concepts 3.4.3 Implication of Diene's theory in teaching/learning activity 3.5 Gagne's theory of learning 3.5.1 The objects of mathematics learning 3.5.2 The phases of learning sequence 3.5.3 Types of learning 3.5.4 Implication of Gagne's theory of learning in teaching/learning mathematics 3.6 Skemp's learning theory 3.6.1 Skemp's learning types 3.6.2 Factors affecting learning types 3.6.3 Implications of Skemp's learning theory in teaching/learning mathematics.

• To give introduction of instructional strategies. • To explain expository activities for teaching skills, concepts and principles. • Define a problem solving and examine different situations for a problem. • List and describe five steps of problem solving. • Define discovery learning strategy and discuss its purposes. • Explain the role of inductive and deductive approaches in developing teaching/learning strategies for discovery learning. • Develop a discovery lesson to teach specific topic in mathematics. • Discuss the elements of model for individualized instruction in mathematics teaching. • List and explain the specific program for individualized instruction. • Identify different classroom techniques for individualized instruction. • Examine teachers' and students' role in constructivist classroom and use them in developing teaching activities. • Analyze teachers' role in handling mathematics classes for socially and culturally diverse students and use them in developing teaching learning activities.	**Unit IV Instructional Strategies (8)** 4.1 Introduction to instructional strategies 4.2 Expository teaching/learning model 4.2.1 Activities in teaching skills, concept and principles 4.3 Problem solving model 4.3.1 Five steps of problem solving model and its use in teaching 4.4 Discovery strategy 4.4.1 definition and purpose of discovery strategy 4.4.2 Inductive and deductive discovery strategy 4.4.3 Development of discovery lesson in mathematics 4.5 Individualized model 4.5.1 The definition of individualized teaching/learning model 4.5.2 Specific program for individualized instruction 4.5.3 Classroom techniques for individualized instruction 4.6 Teaching approaches in constructivism 4.7Teaching approaches in socially and culturally diverse situation
• To give introduction of exceptional children. • To define slow learners in mathematics and list their characteristics and needs. • To describe cognitive difficulties of slow learners. • To explain teaching learning strategies for slow learners and apply them in practice. • To define mathematically gifted students. • To list characteristics and needs of gifted students. • To use teaching learning strategies for	**Unit V: Teaching Exceptional Students (5)** 5.1 Introduction of exceptional students 5.2 Teaching mathematics to slow learners 5.2.1Ccharacteristics and needs of slow learners 5.2.2 Cognitive difficulties of slow learners 5.2.3Teaching/ learning strategies for slow learners 5.3 Teaching mathematically gifted students 5.3.1 Characteristics of gifted students 5.3.2 Needs of gifted students 5.3.3Teaching/learning strategies for gifted students

gifted students in real practice.	
• To explain gender issue in mathematics education. • To explain racial and minority issue in mathematics education. • To describe ethnomathematics as an issue in mathematics education. • To explain cultural issue in mathematics education. • To explain issue related to curriculum, methods and materials.	**Unit VI: Issue in Mathematics Education (6)** 6.1 Gender issue in mathematics education 6.2 Racial and minority issue in mathematics education 6.3 Ethnomathematics as an issue of mathematics education 6.4 cultural issue in mathematics education 6.5 issues related to curriculum 6.6 Issues related to methods and materials 6.7 Issues related to evaluation

4. Methodology and Techniques

Teacher centered as well as student centered teaching methods can be adopted according to nature of content. Instructional techniques applicable to most of the units are lecturer with illustration, expository based demonstration, discussion, group discussion and presentation and collaborative learning methods. For units I, II and VI encourage students to search net materials. In these units let students to prepare group report, individual reports and their presentations.

5. Evaluation Scheme

The assessment of students' performance is made through formative and summative evaluation. Classroom activities, report writing, presentation can be used as formative evaluation. For summative evaluation internal assessment of 40% and external evaluation of 60% will be conducted. Internal assessment should be used as formative evaluation also.

Internal Assessment (40%): Following topics will be considered in internal evaluation

Activity	Marks
sAttendance	5
Classroom Activities	5
Assessment I [report writing(individual/group), project work , presentation]	10
Assessment II [Mid Term exam]	10
Assessment III[Seminar, presentation, developing teaching module]	10
Total	40

External evaluation (60%)

At the end of semester, external examination will be held by the Office of the Controller of Examination for 60% weightage. The types , number of questions and their mark distributions in question paper are presented in the following table. External exam will be taken for 100 marks and then marks obtained will be converted in 60%.

Type of question	Number of questions	Marks for each question	Total marks
Multiple choice	10	1	10
Short answer type	6	10	60
Comprehensive type	2	15	30
Total	18		100

References

Bell, H. F.(1978). *Teaching and learning mathematics.*Wm.c. Brown company publisher

D'Ambrosio, U.(2006). *Ethnomathematics: link between tradition and modernity*. Rotterdam, TheNetherlands: Sense

Ernest, P.(1991). *Mathematics, education and philosophy: An international perspective*. London: The Falmer Press

Ernest, P. (1993). *The philosophy of mathematics education*. Basing stoke, Britain:Taylor and Francis Inc.

Gates, P.(2001). *Issues in mathematics teaching* .London:Falmer

Goos, M., Stillman , G. &Vale, C.(2007). *Teaching secondary school mathematics:Research and practice for 21st century*. Australia: Allen &Unwin.

Hersh, R.(1997). *What is mathematics , really?.* New York: Oxford University Press.

Hersh, R (Ed).(2006). *18 unconventional essays on the nature of mathematics*. New York: Springer

Skep, R. (1982).*The philosophy of learning mathematics.*Hormonds Worth, England: Penguin Books.

Pandit, R. P. (2007*).Foundation of mathematics education*. Kathmandu: Mrs. Indira Pandit

Vygotsky, L. S. (1986). *Thought and language,(13th printing edited by Alex Kozulin).*England: The MIT Press.

Differential Geometry

Course title: Differential geometry **Full marks: 100**

Course No: Math Ed. 522 **Pass marks:40**

Nature of course: Theoretical **credit: 3**

Semester: 2nd

Time per period: 1 hour

1. **Course Description:**
   This is an introductory course on higher concept of geometric configuration. This course provides the students with the basic concepts on differential geometry so as to enable them to develop skills to study the essential ideas of theory of space curves and surfaces using theory of calculus.
2. General objectives:
   - TO develop a better understanding of how calculus can be applied to the study of geometry in the differential geometry.
   - To make the students able to use calculus in defining curves and surfaces in space.
   - To enable the students to prove the theorems on curves and surfaces using calculus.
   - To enable to students in establishing local non intrinsic properties of surface and to acquaint the students with definition of conjugate, asymptotic lines and fundamental equation of surface.

Unit 3 (8 hours) • Define metric and its different form. • Establish conditions for orthogonal trajectories. • Prove theorems related to metric , direction co-efficient , families of curves.	Unit 3: Fundamental form of the surface 3.01 First fundamental form with geometrical interpretation and its properties 3.02 second fundamental form and second order properties of metric 3.03 GEOMETRICAL interpretation of second fundamental form 3.04 Angle between parametric curves 3.05 Direction coefficients and related results 3.06 Families of curves 3.07 Orthogonal 3.08 Double family of curves
Unit 4 (8 hours) • Define lines of curvature. • Prove the related theorems.	Unit 4: Local non intrinsic properties of a surface 4.01 Normal curvature 4.02 MEUSNIER'S theorem 4.03 Principle directions and principle curvatures 4.04 Minimal surface 4.05 Gaussian curvature 4.06 Lines of curvature 4.07 REDRIGES formula 4.08 MENGES theorem 4.09 Lines of Curvatures as parametric curvrd 4.10 Euler's theorem 4.11 JOCHIMSTHAL'S theorem
Unit 5 (8 hours) • Define conjugate directions and asymptotic lines and prove	Unit 5 : Conjugate directions, Asymptotic Lines, Fundamental equation of surface theory 5.01: Conjugate direction and its

related thermos.	properties 5.02: Principal direction and orthogonal Conjugate 5.03: Asymptotic lines and related theorem 5.04: Osculating plane on asymptotic line 5.05: Asymptotic line on ruled surface, 5.06: Curvature and Torsion of asymptotic lines, 5.07: Fundamental equation of surface theory 5.08: Christoffol coefficients 5.09: Gaurs characteristic equation 5.10: Mainardi –codazzi equation

Books recommended and references

1. **Gupta pp malik, G.s and pundir s.k (2008) differential geometry, Meerut Pragati prakashan**
2. **Lal.b. three dimensional differential geometry**
3. **Wilmore, T.J. An introduction to differential geometry. Deli, India oxford university press**

Far-western University
Faculty of Education
M.Ed. Mathematics

Course title-**Linear Algebra** Level-M. Ed
Course no.: Math. Ed. 523 credit hour-3
Semester—2nd Total hours-48

Introduction-Linear algebra is offered as a subject for the student of mathematics in first year (second semester) master level. There are 6 chapters in the course. The course is vast with respect to the course that had been introduced in bachelor level. Some topics like vector space, matrices are repeated with vast and deep knowledge.

COURSE OBJECTIVES-The main objectives of the course is to enable the students

- to develop the depth knowledge in the topics of linear algebra
- to help up for research and further study
- to develop the algebraic skills and apply them in related field

Contents:

Unit 1: Vector space
Definition, subspace, bases, maximal set and subset
Unit2: Linear maps and matrices
Linear mapping, the kernel and image of linear map, composition and inverse of linear mapping, the linear maps associated with a matrix , matrix associated with a linear maps
Unit3: Scalar product on vector space
Scalar product, Hermitian product, orthogonal bases, bilinear maps and matrices, the dual space, applications of linear equation
Unit4: Bilinear forms and the standard operator
Bilinear forms, quadratic forms, symmetric forms, unitary operators, Sylvester's theorem
Unit5: Polynomial and matrices
Polynomial of matrices and linear maps, Eigen values and Eigen vectors the characteristic polynomial, minimal polynomial, decomposition of a vector space with respect to a linear map, Jordern normal form.
Unit6: Triangulation of matrices and linear maps
Existence of triangulation, Hamilton-cayleytheorem, diagonalizationof unitary maps
References

- I.N. Hertain: Topics in algebra, Vicas publication ,India
- Serge Lang; Linear algebra, Third edition(corrected printed,2004),Springer
- P.B. Bhattacharya, S.K. Jain and S.R. Nagpal, first course in Linear algebra, New age international publisher.

Far-Western University
Faculty of Education
M.Ed. in Mathematics

Course title: Topology **Semester**: Second
Course No: Math.Ed. 524 **Credits**: 3
Total periods: 45 **Time per period**: 1 Hour

1. Course Introduction

This course is especially designed for master's student to understand the Topology. The course begins with the review of set topology of real number,metric spaces, topological spaces, , continuity of functions in topological spaces, connectedness and compactness. The course focuses in various types of topological spaces and their properties.

2. Course Objectives: The objectives of this course are as follows:

a) Toreviewthe fundamental concepts of sets of real numbers , ,upper and lower bounds open and closed setsin real line.
b) Toexemplify.ets in metric spacesthe metric spaces with examples and open and closed s
c) Toacquaint with the various types of topological spaces and their basic properties.
d) Tostudy about the continuous functions in topological spaces and understand the properties of continuous functions over the topological spaces.
e) tudyTo sthe connectedness and relative topics of connected spaces.
f) To studythe compactness and relative topics of compact spaces.

3. Contents with Specific Objectives

Specific Objectives	Contents
• Toreview the basics about the upper and lower bounds of sets • To review the finite and infinite sets • To acquaint with Open and closed sets on real lines • To acquaint with the nested interval theorem • Toreview the basics about the plane.	**UnitOne(7)The Line and The Plane :** 1.1 Upper and lower bounds 1.2 Finite and infinite sets 1.3 Open and closed sets on the real line 1.4 The nested interval theorem 1.5 The plane
• To define and exemplify the Metric space • To acquaint with open and closed sets in metric spaces • To define Interior, closure and boundary of sets	**Unit Two: Metric Spaces(5)** 2.1 The definition and some examples 2.2 Open and closed sets in metric spaces 2.3 Interior, closure and boundary
• Todefinetopological spaces and their basis • product topology ,To define order topology .and subspace topology	**Unit Three: Topological Spaces and Continuous Functions (17)** 3.1 Topological spaces

• To acquaint with some important Theorems • Toacquaint with closed sets and limit points • To study continuous functions on topological spaces and their basic properties • To define product topology, metric topology and quotient topology and prove some theorems	3.2 Basis for a topology 3.3 The order topology 3.4 The product topology on XxY 3.5 The subspace topology 3.6 Closed set and limit points 3.7 Continuous functions 3.8 The product topology 3.9 The metric topology 3.10 The quotient topology
• To define connected and totally disconnected spaces • To study about the connected sets over the real line • To define components and path components. • To define local connectedness • To identify the properties of connected spaces, components path components and local connectedness	**UnitFour :Connectedness (8)** 4.1 Connected spaces 4.2 Connected subspaces of real line 4.3 Components 4.4 Local connectedness
• .To define covering and compactness • To study the properties of continuous functions on compact spaces • To study about the compact sets over the real line • Todefine local compactness • To acquaint with some important Theorems	**Unit Five: Compactness)8(** 5.1 Compact spaces 5.2 Compactness of the real line 5.3 Limit point compactness 5.4 Local compactness

4. Methodology and Techniques

Modes of instruction:

- Lecture
- Discussion
- Seminar
- Exercises
- Guided study
- Tutorial
- Independent study
- Project work

Modes of learning:

- Attending lectures,
- Doing assignments,

- Writing papers,
- Independent and private study,
- Reading books, reviewing journals and papers,
- Critiquing
- Group study
- Peer discussion

5. Evaluation Scheme

- Internal 40%
- External 60%

The internal examination will be conducted as follow:

a) Regularity and class participation 5%
b) Quizzes: 3 5%
c) Class presentation: 1 20%
d) Term paper/assignment: 1 20%
e) Mid-term Exam 20%
f) Investigative Project Work: 1 20%
g) Group Work and Pair Work/Group Project: 1 10%

6. References:

a) Croom .by Fred H **Principles of Topology**
b) **Topology A First Course** by J. R. Munkres. (Second Edition)

Far-western University
Faculty of Education
M.Ed. in Mathematics

Course Title: **History of Mathematics** Full Marks: 100
Course No: Math.Ed. 525 Pass Marks: 50
Nature of Course: Theoretical Teaching Hours: 45
Level: Masters
Semester: 2nd

1. Course Description: This course is designed to make the students familiar with ancient civilizations where mathematics played a vital role to uplift human society. It also gives a brief account of mathematicians from antiquity to modern time; their life history and contributions they offered to build up human civilizations. From the time of Abacus to modern computer, mathematicians are trying to make our life easier and more comfortable. So they ought to be remembered and their contribution (the heritage of mathematical knowledge they created) must be appreciated.

2. General Objectives

Broadly, the course has following objectives

- To evaluate the role of mathematics in the development of human civilization.
- To be familiar with life history and contribution of great mathematicians.
- To appreciate the heritage of mathematical knowledge created by our ancestors.

3. Specific objectives

After the completion of this course students will be able to

- Describe the three classical problems and attempts made by different mathematicians, and conclude that their solution is impossible.
- Construct five regular solids and realize that there are no more than five regular polyhedron.
- Explain Golden ratio and Pythagorian contribution.
- Judge the place of mathematics in Plato's Trivium and Quadrivium.
- Familiar with life history and describe the main contribution of different mathematicians.
- Be familiar with Euclidian geometry containe in Euclid's elements.
- Explain how different geometries are evolved.
- Describe various phases of development of calculus.
- Describe the development of mathematics in various civilizations.

4. Contents

Unit I Mathematics in antiquity

1.1 Three classical problems (doubling a square, squaring a circle and trisecting a given angle)

1.2 Platonic solids (five regular polyhedron)

1.3 Pythagorians and their contributions (Pythagoriantriplates, irrational numbers, polygonal numbers, golden ratio- definitions, calculation of it's value and constructions with ruler and compass)

1.4Trivioums and Quagrivioums

1.5 Eucled's elements

Unit II Mathematicians and their contributions

Thales, Pythagoras, Zeno, Archimedes, Eratosthenes, Appollonius, Heron, Diophantus, Pappus, Dascartes, Fermate, Newton, Leibniz, Eular, Napier, Gauss, Bernoulli Brothers, Cantor, BertranedRusswl.

Unit III Development of calculus and geometries

3.1 Analytical geometry, Differential geometry, Projective geometry, Euclidean geometry ande non-Euclidean geometry.

3.2 Calculus

a) Zeno's paradoxes

b) Archemedies' method of equilibrium.

c) Newton- Lebniz dispute

d) Bernoulli brothers' contribution

Unit IV Mathematics in different civilizations

4.1 Egiptian and Babylonian mathematics

4.2 Hindu mathematics

4.3 Chinese mathematics

4.4 Japanese mathematics

4. Methodology and Techniques

Each student will be required to present a paper containing life history and contribution of at least one mathematician assigned by subject teacher. The class will be actively take part in the discussion. Any doubt and confusion raised during discussion will be clarified by teacher(unit2). The teacher may choose any strategy for other units.

5. Evaluation Scheme

The assessment of students performance is made through formative and summative evaluation. Classroom activities, report writing, presentation can be used as formative evaluation. For summative evaluation internal assessment of 50% and external evaluation of 50% will be conducted. Internal assessment should be used as formative evaluation also.

Internal Assessment (50%)

Following topics will be considered in internal evaluation

Activity	Marks
Paper presentation	20
Unit test	15
Assignment	10
Class attendance and participation	5
Total	50

External evaluation (50%)

At the end of semester, external examination will be held by the Office of the Controller of Examination for 50% weightage

References

Eves, H. W. (1976). An introduction to history of mathematics (5^{th} ed.). USA: CBS college publishing

Far-western University
Faculty of Education
M.Ed. in Mathematics Education

Course title: Research Methods in Mathematics Education **Semester**: Third
Course No.: Math.Ed. 531 **Credits** : 3 (48 Hours)

Course Introduction

This is a course designed for Masters level students of Education faculty specializing in Mathematics Education. It aims to address various key concepts of different research paradigms: post/positivistic, interpretive and critical. The course aims at developing competence among the students to plan, and conduct mathematics education research utilizing both quantitative and qualitative research approaches. More specifically, the course incorporates different research designs including survey, case study, ethnography, action research, narrative and critical focusing the issues of mathematics education.

Course Objectives

The objectives of this course are as follows

a) Identify research problems or issues in mathematics teaching/learning, curriculum, assessment, etc.
b) Describe six steps to be followed in conducting research.
c) Have basic orientation to major research traditions (such as survey, case study, ethnography, action research, Grounded theory and Mixed method research)
d) Construct reliability and validity of research tools.
e) Employ appropriate standards to ensure the quality of the proposed research project
f) Develop a detailed research proposal to carry out the research project

Contents in detail with specific objectives

Specific Objectives	Contents in detail
• To be able to describe ontology, epistemology and methodology considered in research in education. • To be familiar with various educational research paradigms with strengths and limitations	**Unit1 : Overview of Research Paradigms (5)** 1.1 Ontology, Epistemology and methodology in research in education. 1.2 Research Paradigms: Positivism, Postpositivism, Interpretivism and Critical Theory.
• To be able to describe six steps to be followed in the process of research. • To be able to compare characteristics of quantitative and qualitative research.	**Unit 2: Six Steps in the Process of Research(8)** 2.1 Six Steps in the process of research 2.1.1 Identifying a Research problem 2.1.2 Reviewing the literature 2.1.3 Specifying a purpose and research question or hypothesis of research 2.1.4 Collecting data

	2.1.5 Analyzing and interpreting data 2.1.6 Reporting and evaluating research 2.2 The characteristics of qualitative and quantitative research in each of the six steps
• To describe how to ensure reliability and validity in different research tools.	**Unit 3. Reliability and Validity (4)** 3.1 Introduction of Reliability and validity 3.2 Reliability and validity of an Interview 3.3 Reliability and validity in Questionnaire 3.4 Reliability and validity in observation 3.5 Reliability and validity in tests 3.6 Reliability and validity in experiments
• To be familiar with survey research in mathematics education. • To be able to conduct survey research concerning topic from mathematics education	**Unit 4: Survey Research in Mathematics Education(4)** 4.1 Introduction of Survey Research 4.2 Types of Survey design 4.3 Mailed questionnaire and Interview 4.4 Characteristics of Survey research 4.5 Steps in conducting survey research
• To be familiar with principles and characteristics of action research • To recognize action research as a critical praxis and role of reflexivity in action research • To apply the various procedures in action research	**Unit 5: Action Research in Mathematics Education (4)** 5.1 Introduction 5.2 Principles and characteristics of action research 5.3 Action research as critical praxis 5.4 Reflexivity in action research 5.5 Procedures for action research
• To be familiar with characteristics of grounded theory research in mathematics education • To be able to conduct grounded theory research by selecting suitable topic from mathematics education	**Unit 6: Grounded Theory Research in Mathematics Education (4)** 6.1 Introduction of Grounded Theory Research 6.2 Types of Grounded Theory design 6.3 Characteristics of Grounded Theory research 6.4 Steps in conducting Grounded Theory research
• To be familiar with characteristics of mixed method research in mathematics education • To be able to conduct mixed method research by selecting suitable topic from mathematics education	**Unit 7: Mixed Method Research in Mathematics Education Research (4)** 7.1 Introduction of Mixed Method Research 7.2 Types of Mixed Method design 7.3 Characteristics of Mixed Method Research 7.4 Steps in conducting Mixed Method Research
• To be familiar with characteristics of Ethnographic research in mathematics education • To be able to conduct Ethnographic	**Unit 8: Ethnographic Research in Mathematics Education(4)** **8.1** Introduction of Ethnographic Research 8.2 Types of Ethnographic research

research by selecting suitable topic from mathematics education	8.3 Characteristics of Ethnographic research 8.4 Steps in conducting Ethnographic research
• To be familiar with quality standards used in quantitative research: Objectivity, generalizability, Predictability • To be familiar with quality standards used in qualitative research: Trustworthiness, Authenticity, Praxis, Pedagogical Thoughtfulness, reflexivity • To maintain ethical issues in Educational Research	**Unit 9: Quality Standards and Ethical Issues in Mathematics Education research(5)** 9.1 Objectivity, generalizability, Predictability 9.2 Trustworthiness, Authenticity, Praxis, Pedagogical Thoughtfulness, reflexivity 9.3 Maintaining Ethical issues in Educational Research
• To be able to develop research proposal	**Unit 10: Developing Research Proposal (6)** 10.1 Problematizing the research issues, writing purpose of the study and developing research questions 10.2 Reviewing relevant literatures 10.3 Articulating research design

Methodology and Techniques

a) Discussion
b) Class Presentation
c) Self –study
d) Group work

Evaluation Techniques

- Internal 40%
- External 60%

The internal examination will be conducted based on the following criteria:

a) Regularity and class participation 5
b) Class presentation: 1 time (5 – 10 minutes) 5
c) Reflective Journals : 5 (1000-1500 words each) 15
d) Research Proposal 15

Prescribed Books

a) Erna Yackel, KoenoGravemeijer, Anna Sfard (2011): A Journey in Mathematics Education Research: Insights from the Work of Paul Cobb, Springer Publication
b) Jürgen Maasz and Wolfgang Schloeglmann (2006): New Mathematics Education Research and Practice : Sense Publishers
c) Creswell, J. (2012). *Educational Research: Planning, Conducting and Evaluating Quantitative and Qualitative Research* (4th Ed.). Pearson Education.
d) Cohen, Manion& Morrison (2007). *Research methods in education*. London: Routledge
e) Bryman, Alan. (2012). *Social research methods*: Oxford university press.

References

a) Barbour, R. (2008). *Introducing qualitative research*. Thousand Oaks, CA: Sage

b) Berg (2007). *Qualitative research methods for the social sciences.* Pearson: NY

c) Bodgon, R.C., &Biklen S. K. (2007): *Qualitative Research for Education: An Introduction to theory and methods* (5th Ed.). Pearson Education

d) Bryman, A & Hardy, M (2004): *Handbook of Data Analysis*: Sage Publication

e) Bryman, A. (2012). *Social research methods.* Oxford: Oxford University Press

f) Corbetta, P. (2003). *Social research: Theory, methods and techniques.* Thousand Oaks, CA: Sage

g) *Creswell, J. (2009)Research design: Qualitative, Quantitative and Mixed Methods Approaches.* Thousand Oaks CA: Sage.

h) Denzin, N. K. &Lincon, Y. S. (2011): *The Sage Handbook of Qualitative research* (4th Ed.): Sage

i) Dowdy, S., Weardon, S., Chilko, D (2004): Statistics For Research (3rd Ed.):A John Wiley & Sons, Inc. Publication

j) Flick, U. (2006). *An introduction to qualitative research*. Thousand Oaks, CA: Sage

k) Gaur,S. A., & Gaur S. S (2011): *Statistical Methods for Practice and Research: A Guide to Data Analysis Using SPSS, (*2nded), SAGE Publication Inc, New Delhi, India.

l) George, D &Mallery, P. (2010): *SPSS for Windows Step by Step, A simple Guide and Reference 17.0 updated* (10th Ed.) Pearson

m) Guba, E.G. & Lincoln, Y.S. (2005). Paradigmatic controversies, contradictions, and emerging confluences. In N.K Denzin& Y.S. Lincoln (eds.) *The Sage handbook of qualitative* research (3rd ed.). Thousand Oaks: Sage

n) Kincheloe, J., & McLaren, P. (2005). Rethinking Critical Theory and Qualitative Research. In N. Denzin& Y. Lincoln (Eds.), *The Sage Handbook of Qualitative Research* (3rd ed.,) London: Sage.

o) Madison, DS (2005). *Critical ethnography: Method, ethics, and performance (Chapter 1)*. Thousand Oaks, CA: Sage

p) Teddlie, C. &Tashakkori, A (2009): Foundation of Mixed Methods Research: Sage Publication

q) Taylor, P.C. & Medina, M. (2011). Educational research paradigms: From positivism to pluralism. *College Research Journal, 1*(1), 1-16. Assumption College of Nabunturan, Philippines.

r) Taylor, Peter Charles, Taylor, Elisabeth, &Luitel, Bal Chandra. (2012). Multi-Paradigmatic transformative research as/for teacher education: An integral perspective. In K. Tobin, B. Fraser & C. McRobbie (Eds.), *Second international handbook of science education* (pp. 373-388). Dordrecht, The Netherlands: Springer.

s) Willis, J. (2007). *Foundational issues: Postpositivist and critical perspectives.* Thousand Oaks, CA: Sage

Far-western University
Faculty of Education
M.Ed. in Mathematics

Course Title: **Projective Geometry** Full Marks: 100

Course No: Math.Ed. 532 Pass Marks: 50
Nature of Course: Theory Teaching Hours: 45
Level: Masters
Semester: Third

1. Course Description

This course is designed for post graduate students to develop the understanding projective geometry using modern abstract approaches. The course deals with incidence structures, collineations, Desarguesian and Pappin planes, conics and projective spaces.

2. General Objectives

Broadly, the course has following objectives

- To develop an understanding in using properties of incidence structures as axioms to develop properties of geometric structures.
- To enable the students to analyze mathematical structures through the use of functions.
- To enable students to prove properties of Desarguesian planes and Pappin planes.
- To develop understanding of conics from projective view point.
- To develop understanding of properties of projective space.

3. Specific objectives and contents

Specific Objectives	Contents
• To define incidence structure. • To recognize geometric planes • To use isomorphism in establishing properties of planes • To define duality and apply them in proving theorems. • Define configuration and use them in proving theorems regarding projective planes and sub planes.	**Unit I: Incidence Geometry (9)** 1.1 Incidence structure 1.2 Planes 1.3 Isomorphism 1.4 Duality 1.5 Configurations 1.6 Sub-planes
• To define perspectivity, projectivity and collineations • To use and apply perspectivity, projectivity and collineations in establishing theorems.define extended collineations and use them in proving theorems.	**Unit II: Collineations (9)** 2.1 Perspectivities 2.2 Projectivities 2.3 Collineations 2.4 Metric induced collineations 2.5 Central collineations 2.6 Automorphiccollineations

• To define Desarguesian planes and develop their properties. • To define Pappin planes and develop their properties. • To explain projective planes as generalization of real projective plane.	**Unit III: Desarguesian and Pappin planes (9)** 3.1 Desarguesian Planes 3.2 Projectivities in Desarguesian 3.3 Coordinates in Desarguesian planes 3.4 Pappin planes
• To define conic from projective view point. • To derive Desarguesian and Pascal's theorems for conics. • To define polarities and establish related theorems.	**Unit IV: Conics in Pappian planes (9)** 4.1 The projective definition of conic 4.2 Intersection of range and point conic 4.3 Conics in a closed planes 4.4 Desargue's conic theorem 4.5 Pascal's theorem and it's converse 4.6 Polarities
• To explain projective space as generalization of projective planes. • To derive properties of projective spaces. • To prove theorems of homomorphism in projective spaces	**Unit V: Projective Spaces (9)** 5.1 Projective spaces 5.2 Desargue's theorem and algebraic examples 5.3 Homomorphisms

4. Methodology and Techniques

The applicable instructional techniques are lecture with illustrations, group discussion and presentation, collaborative learning method . Teacher should select the method or combination of methods according to nature of content.

5. Evaluation Scheme

The assessment of students' performance is made through formative and summative evaluation. Classroom activities, report writing, presentation can be used as formative evaluation. For summative evaluation internal assessment of 40% and external evaluation of 60% will be conducted. Internal assessment should be used as formative evaluation also.

Internal Assessment (40%)

Following topics will be considered in internal evaluation

Activity	Marks
Attendance	5
Classroom Activities	5
Assessment I [report writing(individual/group), project work , presentation]	10
Assessment II [Mid Term exam]	10
Assessment III[presentation on seminar]	10
Total	40

External evaluation (60%)

At the end of semester, external examination will be held by the Office of the Controller of Examination for 60% weightage. The types, number of questions and their mark distributions in question paper are presented in the following table. External exam will be taken for 100 marks and then marks obtained will be converted in 60%.

Type of question	Number of questions	Marks for each question	Total marks
Multiple choice	10	1	10
Short answer type	6	10	60
Comprehensive type	2	15	30
Total	18		100

Recommended Book

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

Reference Book

Bumcrot, R. J. (1969). *Modern projective geometry*. New York: Holt Rinehart and Wineston .Inc.

Far-Western University
Faculty of Education
M.Ed. in Mathematics

Course title: Special Function
Course No: Math Ed. 533
Total periods: 45

Semester: Third
Credits: 3
Time per period: 1 Hour

1. Course Introduction

This course is especially designed for master's student to understand the different kinds of functions. The course begins with the review of infinite products, Gamma and Beta functions along with the introduction of Euler's product and factorial functions. The course focuses in Hypergeometric functions and its several forms, Bessel's functions, Legendre's polynomials.

2. Course Objectives: The objectives of this course are as follows:

a) To review the fundamental concepts of infinite products, Gamma and Beta functions.
b) To acquaint with the various forms of Hypergeometric functions and properties.
c) To study about Bessels's function its differential equation, generating function, Bessel's integral and and various results consisting Bessel's function.
d) To introduce Confluent Hypergeometric function along with Kummer's first and second formula.
e) To study about Legendre Polynomials its generating function, differential equation, Rodrigue's formula, Batman's generating function.

3. Contents with Specific Objectives

Specific Objectives	Contents
• To review the basics infinite products • To acquaint with absolute and uniform convergence • To acquaint with the associated series for logarithm.	**Unit One: Infinite Products (3)** 1.1 Definition of an infinite product 1.2 A necessary condition for convergence 1.3 The associated series for logarithm 1.4 Absolute convergence 1.5 Uniform convergence
• To define the Euler or Mascheroni constant γ • To acquaint with Gamma and Beta functions • To acquaint with the series for $\Gamma'(z)/\Gamma(z)$ • To find the values of $\Gamma(1)$ and $\Gamma'(1)$ • To study about Euler product and Euler integral for $\Gamma(z)$ • To study about the differential equation $\Gamma(z+1) = z\Gamma(z)$ • To acquaint with the method of finding value of $\Gamma(z)\Gamma(1-z)$ • To acquaint with the factorial function, Legendre's duplication formula, Gauss' multiplication formula	**Unit Two: The Gamma and Beta Function (8)** 2.1 The Euler or Mascheroni constant γ 2.2 The Gamma function 2.3 A series for $\Gamma'(z)/\Gamma(z)$ 2.4 Evaluation of $\Gamma(1)$ and $\Gamma'(1)$ 2.5 The Euler product for $\Gamma(z)$ 2.6 The differential equation $\Gamma(z+1) = z\Gamma(z)$ 2.7 Euler integral for $\Gamma(z)$ 2.8 The Beta function 2.9 The value of $\Gamma(z)\Gamma(1-z)$ 2.10 The factorial function 2.11 Legendre's duplication formula 2.12 Gauss' multiplication formula

• To define hypergeometric functions • To define contiguous functions and establish its relations • To derive hypergeometric differential equation • To acquaint with quadratic transformation, Kummer's Theorem	**Unit Three: The Hypergeometric Function (10)** 3.1 The function $F(a, b; c; z)$ 3.2 A simple integral form 3.3 $F(a, b; c; 1)$ as a function of the parameters 3.4 Evaluation of $F(a, b; c; 1)$ 3.5 The contiguous function relations 3.6 The hypergeometric differential equation 3.7 Elementary series multiplication 3.8 Simple transformations 3.9 A quadratic transformation (Only idea) 3.10 Other quadratic transformation(Only idea) 3.11 A theorem due to Kummer(Only idea) 3.12 Additional properties(Only idea)
• To define generalized hypergeometric function • To express the special case of the function pFq as the exponential and binomial functions • To deduce the differential equation of generalized hypergeometric function • To acquaint with integral representation of generalized hypergeometric function • To acquaint with Saalschutz' theorem and Wipple's theorem	**Unit Four: Generalized Hypergeometric Functions(6)** 4.1 The function pFq 4.2 The exponential,binomial function 4.3 The differential equation 4.4 A simple integral representation 4.5 Saalschutz' theorem 4.6 Wipple's theorem (only for terminating series)
• To define Bessel's function • To deduce the differential equation of Bessel's function • To study about pure and differential recurrence relations • To acquaint with Bessel's integral, Index half an odd integer and Modified Bessel function	**Unit Five: Bessel Function (7)** 5.1 Definition of $J_n(z)$ 5.2 Bessel's differential equation 5.3 Recurrence relation (differential and pure both) 5.4 A generating function 5.5 Bessel's integral 5.6 Index half an odd integer 5.7 Modified Bessel function
• To define the confluent hypergeometric function • To prove Kummer's first and second formula	**Unit Six: The Confluent Hypergeometric Functions(3)** 6.1 Definition of 1 F 1 6.2 Kummer's first formula 6.3 Kummer's second formula
• To define Legendre's polynomial • To establish differential recurrence relation • To deduce Legendre's differential equation • To acquaint with Rodrigues formula and Batman's generating function • To study some other generating functions • To acquaint with hypergeometric form of $P_n(x)$.	**Unit Seven: Legendre Polynomial (8)** 7.1 A generating function 7.2 Differential recurrence relation 7.3 Legendre's differential equation 7.4 The Rodrigues formula 7.5 Batman's generating function 7.6 Additional generating functions 7.7 Hypergeometric form of $P_n(x)$.

4. Methodology and Techniques

Modes of instruction:

- Lecture
- Discussion
- Seminar
- Exercises
- Guided study
- Tutorial
- Independent study
- Project work

Modes of learning:

- Attending lectures,
- Doing assignments,
- Writing papers,
- Independent and private study,
- Reading books, reviewing journals and papers,
- Critiquing
- Group study
- Peer discussion

5. Evaluation Scheme

- Internal 40%
- External 60%

6. References:

a) **Special Functions** by Earl D. Rainville (University of Michigan)
b) **Special Functions** by Z X Wang and D R Guo (Peking University)
c) **Special Functions and their Applications** (Revised English Edition translated and edited by Richard A. Silverman) by N N Lebedev

Far-western University
Faculty of Education
M.Ed. in Mathematics

Course Title: **Operation Research** Full Marks: 100
Course No: Math. Ed. 534 Pass Marks: 50
Nature of Course: Theory Teaching Hours: 45
Level: Masters
Semester: Third

1. Course Description

This course is designed for post graduate students to develop the understanding of different techniques of operations research. It consist topics from applied mathematics. The course deals with linear programming, transportation problem, assignment problem and queuing theory.

2. General Objectives

Broadly, the course has following objectives

- To acquaint students with linear programming models.
- To enable the students to solve LPP by using simples methods.
- To enable students to solve LPP by converting it into its dual
- To develop skills of solving assignment problems.
- To develop skills of solving transportation problems.
- To familiarize students with queuing theory and provide skills to solve related problems

3. Specific objectives and contents

Specific Objectives	Contents
• To describe structure of linear programming model and mention its application and limitations • To write general mathematical model of linear programming model formation	**Unit1:Linear programming (application and model formulation)** 1.1 Introduction 1.2 structure of linear programming model 1.3 limitation of linear programming 1.4 application of linear programming 1.5 general mathematical model of linear programming model formulation
• To describe standard form of LPP • To describe different techniques for solving LPP in different cases and apply them in solving linear programming problems.	**Unit 2:linear programming (The simplex method)** 2.1 Introduction 2.2 Standard form of an LP problem 2.3Simplex Algorithm (maximization case)

	2.4 Artificial variable technique (a) two phase method (b) the big method 2.5 Types of linear programming solution (a)alternative optional solutions (b) unbounded solution (c) Infeasible solutions 2.6 Some complication and their resolution (a) unrestricted variable (b) tie for entering basic variable (c)tie for leaving basic variable (degeneracy)
• To describe process of formulation of dual linear programming problem and use this process in solving linear programming problems.	**Unit 3: Duality in linear programming** 3.1 Introduction 3.2 formulation of dual linear programming
• To define transportation problem and describe mathematical model of transportation problem. • To explain different methods of finding initial solution (north west corner, least cost, Vogel's approximation method) and apply them in finding initial solution of transportation problem. • To describe different tests of optimality and apply them in testing optimality of transportation. • To solve maximization transportation problem.	**Unit 4: Transportation problem** 4.1 Introduction 4. 2 Mathematical model of transportation problem 4.3 The transportation method 4.4 method for finding initial solution a. north west corner method b. least cost method c. Vogel's approximation 4.5 Test of optimality a. dual transportation method b. steps of MOD method c. loops in transportation and their properties 4.6 Variations in transportation problem 4.7 Maximization transportation problem
• To state assignment problem mathematically • To solve different types of assignment problems using different techniques	**Unit 5: Assignment Problem** 5.1 Introduction 5.2 Mathematical statement of the problem 5.3 Solution methods of assignment problem 5.4 Variations of the assignment

	problem 5.5 A typical assignment problem 5.6 Travelling salesman's problem
• To describe essential features of queuing theory. • To describe probability distribution in queuing system. • To classify queuing models and to solve them. • To describe single server queuing models solve them. • To describe multi server queuing models and solve them.	**Unit 6: Queuing Theory** 6.1 Introduction 6.2 Essential features of queuing theory 6.3 Performance measure of queuing theory 6.4 Probability distributions in queuing system 6.5 Classification of queuing models and their solutions 6.6 Single server queuing models and their solutions 6.7 Multi-server queuing models

4. Methodology and Techniques

The applicable instructional techniques are lecture with illustrations, group discussion and presentation, collaborative learning method, Problem posing method, Problem solving method. Teacher should select the method or combination of methods according to nature of content.

5. Evaluation Scheme

The assessment of students' performance is made through formative and summative evaluation. Classroom activities, report writing, presentation can be used as formative evaluation. For summative evaluation internal assessment of 40% and external evaluation of 60% will be conducted. Internal assessment should be used as formative evaluation also.

Internal Assessment (40%)

Following topics will be considered in internal evaluation

Activity	Marks
Attendance	5
Classroom Activities	5
Assessment I [report writing(individual/group), project work , presentation]	10
Assessment II [Mid Term exam]	10
Assessment III[presentation on seminar]	10
Total	40

External evaluation (60%)

At the end of semester, external examination will be held by the Office of the Controller of Examination for 60% weightage. The types, number of questions and their mark distributions in question paper are presented in the following table. External exam will be taken for 100 marks and then marks obtained will be converted in 60%.

Type of question	Number of questions	Marks for each question	Total marks
Multiple choice	10	1	10
Short answer type	6	10	60
Comprehensive type	2	15	30
Total	18		100

Recommended Book

Sharma, S. D. (2007). *Operations Research*. New Delhi: KedarNath Ram Nath

Course Title: Computer Science in Mathematics Education
Course No: Math. Ed. 535
Nature of the Course: Theory+practical
Level: M.Ed.
Year: Second
Semester: Third

Credit: 3
Number of hours per week: 3+3
Total hours: 48

1. Course Introduction

Fundamental concept of Information technology, Computer systems, computer hardware and Software, input, output and storage devices, Binary system, programming languages, Data files and DBMS, fundamental concept of telecommunication, networking and internet and application of computer systems.

2. Objectives

This course introduces fundamental concepts of Information Technology and Computer Systems. To develop an understanding of the existing and emerging trends in computer science education in students and make students aware of the educational use of computers.

3. Contents in detail with Specific objectives

Specific Objectives	Contents
• What is data and information? • Describe processing cycle. • Describe what is hardware and software. • Understand the evolution of computers, from refining of abacus to supercomputers. • Understand the advancement in technology that has changed the way computers operate, efficient, size, and cost. • Understand the use of computer in education	**Unit I: Introduction to computer** **(5 Hrs)** Introduction, Historical perspective of computer, Types of computers, Characteristics of computer, Generation of computer, Need and purpose of computer in education, Technological development & it's impact on education, Data Processing Cycle, Computer applications.
Understand the basic units Understand how the basic digital computer is organized Describe the purpose of basic units of computer systems.	**Unit II: Computer Hardware** **(10 Hrs)** Basic structure of computer, The Central Processing Unit (Control Unit, Arithmetic and Logic Unit, Main Memory), Input units(keyboard, mouse, light pen, trackball, joystick,

• Familiarize with various input and output devices • Understand memory organization	touch pad, touch screen, BCR, MICR, OCR), Output unit(monitor, printer, speaker, plotter), Memory unit(RAM,ROM), Secondary storage(magnetic tape, magnetic disk, optical disk, flash memory), Data and Control paths in the computer (buses or highways). The Fetch-execute Cycle.
• Understand significance of software in computer system & its relationship with hardware • Discuss role of system software & application software's • Exemplify system software's along with their importance & use. • Discuss application software's & different application packages • Discuss different programming languages	**Unit III: Software** **(12 Hrs)** Definition and Significance, Relationship between Hardware and Software, Types of Software, Types of operating system, Function of operating system, Programming languages, Types of programming language, Language translators, Features of modern software, Application software(word processor, spread sheet, presentation package),
• Describe computer networks and its various types. • Discuss various computer network topologies. • Understand the concept of WWW, Internet in terms of their uses, advantages and disadvantages. • Learn about the different browsers and its uses. • Learn various internet application viz email, FTP. • Understand fundamental concepts of HTTP and its uses.	**Unit IV: Data communication &computer network** **(10 Hrs)** Serial and Parallel transmission compared. Simplex, Half-duplex and Duplex modes. Modems and Multiplexors. Simple Interfaces. Character Codes. Basic communications facilities and the concept of bandwidth, Concepts of Local Area Networks, Wide Area Networks and the Internet. Computer network topologies. The World Wide Web: the concept, its uses and possible disadvantages. Internet Service Providers. Web pages: construction and access; the role of Hypertext Markup Language (HTML) and Java. The concept of electronic mail and its basic uses. The basic functions of browsers.

• Understand the concept behind database, file, record, field and character.
• Understand different types of data files and access methods.
  • Understand concept of database
  • Understand organization of data
	Unit V: Data Files & DBMS **(5 Hrs)**
	
	Definitions of file, record, field and character, The concepts of file organization file access and file processing (updating), The main types of data file such as master and transaction, Serial, sequential and indexed sequential organization, Direct access and serial access, Updating sequential (tape or disc) files and indexed sequential files, Concepts of a simple database, Advantages and disadvantages of DBMS, Types of data models

• Familiarize with the different mathematical software • Understand concept of programming methodology • Understand operation of MATLAB	**Unit VI: Mathematical software** **(6 Hrs)** Introduction to mathematical software, introduction to MATLAB, Basic operation and commands, Control structures, Create and manipulate variables, Import or export data, Program and run simple scripts, use graphical tools to display data

Practical examination: Practical examination will be taken at the end of the semester. Students must demonstrate the knowledge of the subject matter.

Recommended Books:

- Longmans , **Glossary of Computing Terms, British Computer Society,** ISBN 0582-36967-3 or ISBN 0582-47594-5
- C S French , **Computer Science,** Fifth edition; Continuum; ISBN 0-8264-5460-7
- Geoffrey Knott and Nick Waites, **Computing**, Third edition; Business Education Publishers; ISBN 1901-888215
- Capron and Johnson, **Computers: Tools for an Information Age**, Eighth edition; Prentice Hall; ISBN 0-13-122723-8
- Ray Bradley; Stanley Thornes, **Understanding Computer Science,** ISBN 0-7487-4046-5
- Alexis Leon, Mathews Leon, **Fundamentals of Information Technology**, Leon TechWorld
- V. Rajaraman , **Fundamentals of Computers**
- Hart, David & Clinton wolfe, Getting started with MATLAB
- Peter I. kattan, MATLAB for beginners- A gentle approach

Farwestern University

Faculty of Education

Course No. Math. Ed. 541

Level: M Ed

Semester: 4th

Credit Hours: 3

Total Hours: 48

Sub: Complex Analysis

Chapter-1

Complex number and their geometrical representation

1.1 Complex number

1.2 Properties of addition of complex number

1.3 Properties of the multiplication of complex numbers

1.4 Division of complex numbers

1.5 Modulus of complex numbers

1.6 Difference of complex numbers

1.7 Conjugate of complex numbers

1.8 Different forms of complex numbers

1.9 The geometrical interpretation of complex numbers

1.10 Properties of module and arguments

1.11 The important results about complex number

1.12 Integral and rational power of a complex number

Chapter-2

Analytic functions

2.1 Curves in Argand plane

2.2 Functions of a complex variable

2.3 Neighborhood of a point

2.4 Limits and continuity

2.5 Differentiability

2.6 Analytic, holomorphic and regular functions

2.7 The necessary and sufficient conditions for f(z) to be analytic

2.8 Polar form of Cauchy Riemann equation

2.9 Derivative of w=f(z) in polar form

2.10 Orthogal system

2.11 Harmonic function

2.12 Methods of constructing a regular function

2.13 Multiple valued function

Chapter-3

Complex integration

3.1 Introduction

3.2 Definitions

3.3 Complex integration

3.4 Evaluation of some integral abtnitio (By definition)

3.5 Reduction of functions of arcs

3.7 Cauchy's fundamental theorem

3.8 Cauchy's Goursat theorem

3.9 Cauchy's Goursat theorem (second proof)

3.10 Higher order derivative of an analytic function

3.11 Poission's integral formula for circle

3.12 Morera's theorem

3.13. Cauchy's inequality

3.14 Indefinite integral

3.15 Integral function

3.16 Expansion of analytic function as power series

Chapter-4

Singularities

4.1 Zeros of a function, singular points

4.2 Different types of singularities

4.3 Poles and zeros are isolated

4.4 Limiting point of zeros and poles

4.5 Theorems on pole on singularities

4.6 Polynomials, characteristics of polynomial

4.7 Maximum modulus principle

4.8 Minimum modulus principle

4.9 The argument principle, maximum modulus principle

4.10 Rouche's theorem

4.11 Schwartz lemma

4.12 Fundamental theorem of algebra

Chapter-5

The calculus of residue

5.1 Residue at a pole

5.2 Residue at infinity

5.3 Computation of residue at a finite pole

5.4 Jordan's lemma

5.5 Integration around unit circle

5.6 Cauchy's residue theorem

5.7 Evaluation of integral $\int_{-\infty}^{\infty} f(z)dz$ when f(z) has no poles on real line

5.8 Evaluation of integral $\int_{-\infty}^{\infty} f(z)dz$ when f(z) has poles on real line

5.9 Integral of many values function

5.10 Rectangular and other contour

Chapter-6

Conformal representation

6.1 Transformation, Jacobin transformation

6.2 Conformal transformation

6.3 Some general transformation

6.4 Bilinear transformation

6.5 Transformation $w = z^2$

6.6 Transformation $z = \sqrt{w}$

6.7 Transformation z = csinw

Reference:

1. Functions of a complex variables

Dr. J.K. Goyal, K.P. Gupta

2. Complex analysis

Dr. Vipin Vasistha, A.R. Vasistha

3. Complex variable and application

James Ward Brown, Ruel V. Churchill

Far-western University
Faculty of Education
M.Ed. in Mathematics

Course Title: **Trends in Mathematics Education** Full Marks: 100

Course No: Math.Ed. 542 Pass Marks: 50
Nature of Course: Theory Teaching Hours: 45
Level: Masters
Semester: Third

1. Course Description

This course is designed for post graduate students to develop the understanding of trends in mathematics education. The course deals with trends in mathematics education at school and university; Geometry in schools; Applied mathematics; Mathematics education conferences and research in mathematics education.

2. General Objectives

Broadly, the course has following objectives

- To familiarize students with trends of mathematics education at different levels of schools and at university.
- To make students able in sketching trend in geometry teaching in different countries including Nepal.
- To make students able to sketch trend in teaching applied mathematics.
- To make students able in sketching different trends that are observed in development of different commissions, unions and conferences.
- To familiarize students with trends that are observed in the research in mathematics education

3. Specific objectives and contents

Specific Objectives	Contents
• To sketch the trends that are that are observed all-round the globe in mathematics education at different levels of schools and at university specially with respect to curriculum, content, materials , teachers role and researches.	**Unit I: Mathematics Education at Different School Levels and at University Level(10)** 1.1 Trends in mathematics education in pre-primary and primary level 1.2 Trends in mathematics education in lower secondary and secondary level 1.3 Trends in mathematics education in upper secondary and college level 1.4 Trends in mathematics education at university education
• To explain elementary Euclidean geometry with respect to objectives, difficulties and different concepts. • To sketch the trends in geometry teaching in different countries including Nepal. • To describe the dilemma in terms of issues and problems of the teaching geometry for 21^{st}centuray. • To sketch the trends how different geometries form a family by Erlanger program.	**Unit II: Geometry in Schools(10)** 2.1 Reforms in school geometry 2.2 Trends in geometry teaching in different countries including Nepal 2.3 Issues and problems on teaching geometry for 21^{st} century 2.4 Erlanger program for unifying geometry

• To explain the trends how the concept of applied mathematics changed with time. • To explain the issues and problems of applied mathematics in mathematics education. • To analyze impact of applied mathematics on mathematics education.	**Unit III: Educational Implication of Applied Mathematics(5)** 3.1 Introduction 3.2 Trends in teaching applied mathematics 3.3 Issues and problems of applied mathematics in mathematics education 3.4 The impact of applied mathematics in mathematics education
• To sketch the different trends that are observed in the historical development of different Commissions, Unions, Conferences and Olympiads. • To describe the aims, activities and responsibilities of ICMI and IMU. • To describe the achievement of different international Congress and regional conferences. • To describe International Mathematical Olympiads.	**Unit IV: Mathematics Education Conferences(10)** 4.1 International Mathematics Union (IMU) 4.2 International Commissions on Mathematical Instruction(ICMI) 4.3 Mathematics Congress in different countries 4.4 International Congress in Mathematical Education(ICME) 4.5 International Mathematical Olympiads(IMO)
• Sketch the trends that are occurred in the mathematics education research. • Describe three traditions in research in mathematics education in terms of goal of inquiry and teachers role.	**Unit V: Research in Mathematics Education(10)** 5.1 Introduction 5.2 Kinds of research in mathematics education 5.3 Trends in mathematics education research • Historical trend in mathematics education research • Modern trends in mathematics research • The trends towards action research 5.4 Area of research

4. Methodology and Techniques

Teacher centered as well as student centered teaching methods can be adopted according to nature of content. Instructional techniques applicable to most of the units are lecturer with illustration, expository based demonstration, group discussion and presentation and collaborative learning methods.

5. Evaluation Scheme

The assessment of students' performance is made through formative and summative evaluation. Classroom activities, report writing, presentation can be used as formative evaluation. For summative evaluation internal assessment of 40% and external evaluation of 60% will be conducted. Internal assessment should be used as formative evaluation also.

Internal Assessment (40%)

Following topics will be considered in internal evaluation

Activity	Marks
Attendance	5
Classroom Activities	5
Assessment I [report writing(individual/group), project work , presentation]	10

Assessment II [Mid Term exam]	10
Assessment III[presentation on seminar]	10
Total	40

External evaluation (60%)

At the end of semester, external examination will be held by the Office of the Controller of Examination for 60% weightage. The types, number of questions and their mark distributions in question paper are presented in the following table. External exam will be taken for 100 marks and then marks obtained will be converted in 60%.

Type of question	Number of questions	Marks for each question	Total marks
Multiple choice	10	1	10
Short answer type	6	10	60
Comprehensive type	2	15	30
Total	18		100

References

Updhyay, H. P. et. Al. (2067).*Trends in mathematics education*. Kathmandu: Balbalika Education Publication Pvt. Ltd.

Pandit, R. P. (2064).*Recent trends in mathematics education*. Kathmandu: Indira Pandit.

Clkements, M. A. andEllerton , N. F. (1996). *Mathematics education research: past, present and future*. Bankok: Unesco.

Greewood, D. J. and Levin , M. (1998). *Introduction to action research: Social research for social change.* New Delhi: SAGE Publication.

Altrichter, H., Posh, P., Somekh, B. (1995). *Teachers investigate their work: An introduction to the methods of action research.* London: Routledge.

Far-western University
Faculty of Education
M.Ed. in Mathematics of Education

Course Title: **Teaching Practice** Semester: IV
Course No.: Math.Ed.543 Full Marks: 100
Credit Hour: 3 (45 hours) Pass Marks: 50

1. Course Introduction

This is a practical course in which students are required to prepare and present lessons in the classrooms. This is an opportunity for them to implement what they have learnt in their course work. This course is divided into two parts; on-campus preparation and off-campus teaching. In the on-campus preparation, students learn to plan their lessons, activities and tasks and present them to their peers in micro-teaching contexts. In the second part of the course, students will go to the designated institution for supervised teaching.

2. Course Objectives

The objectives of the course are:

a) to enable the students to prepare lesson plans and teaching materials
b) to engage them in designing teaching/learning activities and tasks
c) to involve them in micro-teaching as a preparation to the real teaching
d) to develop in students class observation skills
e) to expose students in classroom context for real teaching experience
f) to enable them to prepare case studies and conduce co-curricular activities.

3. Course Contents

Part I: On-campus preparation

Prior to the real teaching in schools/colleges, the students will be engaged in the preparatory work. This part of the course will consist of two key components; lesson plan preparation, supervised micro-teaching.

a) Lesson Plans, Activities and Tasks

Each student will be required to prepare at least 20 lesson plans from various related courses prescribed for grades 11, 12 of Higher Secondary Education Board (HSEB) and the undergraduate courses of various universities and submit them to their tutors/supervisors. The students will work closely with their tutors/supervisors to improve their lesson plans including the activities and tasks.

b) Supervised Micro-teaching

Each student will be required to present at least ten micro-lessons to their peers in a micro-teaching context and this will be closely supervised by their tutors/supervisors. Students will improve their lessons based on the feedback given by their tutors/supervisors and their colleagues and submit the final versions of the ten micro lessons to their tutors/supervisors for final grading.

Part II: Off Campus Real Teaching and Other Activities:

Each student will be assigned to teach either in a college or a campus. In addition to classroom teaching, students will also be engaged in organizing co-curricular activities and writing a case study report.

a) Actual Teaching

Students will teach a minimum of 30 lessons in the class they are assigned. Prior to their teaching in the colleges/campus, students will be required to prepare the lessons including the tasks, activities, worksheet and teaching materials and show them to their tutor/supervisor. Tutors/supervisors will observe the classes at a fixed interval and provide feedback on a regular basis. Out of thirty lessons, at least 7 classes will be supervised by their tutor/supervisor.

b) Case Study

Each student will be asked to identify a particular case for a detailed study during their classroom teaching. In their day-to-day classroom teaching, student teachers will encounter various situations and they might want to have a close look at something that they have noticed. They will be encouraged to identify a particular case such as a student who seems to possess extra talent, a student with a unique learning style, a student who seems to be aloof and isolated in class, a student or a group of students who are less confident to speak English in class etc.and do an in-depth study of aparticular case. Student teacher will collect the data to understand the case and prepare a report (in about 2500 words) either to learn lessons or address the problem that lies in the case.

c) Co-curricular Activities

Students either in group or individually should organize at least one co-curricular activity in the college/campus where they are assigned to teach. Such an event might include spelling contest, quiz contest, debate, class presentation etc. After the completion of the event, they will need to submit a report to their tutor/supervisor.

5. Evaluation Scheme

5.1. On-campus internal evaluation 40%

- Preparation of lesson plan, teaching learning activities, tasks, worksheet 10%
- Supervised micro-teaching 30%

5.2. Off-campus teaching 60%

- Real classroom teaching 40 marks
- Case study 10 marks
- Co-curricular activities event report 10 marks

6. Prescribed Texts

a) Cohen, L., Manion, L. and Morrison, K. (2008). *A guide to teaching practice*. Oxon. Routledge.

b) Richards, J. C. and Farrell, T. S. C. (2011). *Practice teaching; a reflective approach*. Cambridge. Cambridge University Press.

Far-western University
Faculty of Education
M.Ed. in Mathematics of Education

Course Title: **Thesis**
Course No. Math.Ed.544
Credit Hour: 6 (90 hours)

Semester: IV
Full Marks: 100

Pass Marks: 50

1. Course Description

This is a research course in which the students carry out research work and produce a thesis document. The course begins with the introductory work such as background reading, brainstorming for the research topic, elaborated discussion on the topic with their supervisor(s) and their friends, identifying the appropriate methods of the inquiry process including the design and procedures. Then the students will carry out the research and write a thesis for final evaluation.

2. Course Objectives

The objectives of course are as follows:

a) to practically introduce the students to the inquiry process in the world of academia
b) to offer them a framework for their research project
c) to help them find the appropriate research design for their research
d) to provide them backstopping support during their research process
e) to guide them to successfully complete their research.

3. Contents and Process in Detail

Research is a phase-wise process. Each phase requires a careful planning. The entire research project can be divided into following five key stages:

Stage One: Pre-research phase

In this phase students do some background reading in the area of their interest. Getting the right topic for the research is the most difficult task. One way of thinking of a research topic is to look into the problems, challenges and concerns in the related field. It is not necessary to be very specific about the topic at this stage. This will be done later. Students need to read books, references and previous research work in order to crystalize their idea. Once the students have some idea of what they are going to do for their research, they can list some possible research topics and talk to their supervisors who will guide them to finalize the topic.

Stage Two: Proposal Phase

In this phase, the students will write the proposal on their research topic under the close supervision of their supervisor. If a proposal is academically rich and procedurally well built, half of the research is done. A proposal is a roadmap that outlines the details of how the researcher is going to undertake the research journey. Proposal should clearly mention what is going to be researched, how it is going to be researched and what is expected from

the research. The proposal should be written according to the format provided by the department. However, the proposal should include the following key components:

1) Introduction of the research topic
2) Research problem
3) Review of related literature
4) Research objectives
5) Research questions
6) Research design
7) Research instruments
8) Research sample
9) Research process
10) Analysis and discussion framework
11) Timeline
12) References

Once the proposal is ready, it should be submitted to the department through the supervisor and the department will ask the students to present it to the panel of experts from the department. The experts will provide feedback on the proposal and the student will submit the final version to the department for final approval.

Stage Three: Research Phase

In this phase the student will go to the field and collect the data. Depending upon the nature of research, the data could be collected from the respondents or reviewing the secondary sources in the library. Collecting rich data is very crucial in research as the entire thesis will be written based on the data collected at this stage. In addition to the research instrument, students should also have a diary and they need to make notes of anything relevant that they observe during the field which are not necessarily covered by the research instrument. Students need to report the progress of their field work to their supervisors on a regular basis.

Stage Four: Thesis Writing Phase

Once the data are collected, they need to be organized in a systematic manner. The data should be read and re-read so that the researcher could make a clear mind map for the discussion. Looking at the patterns in the data, themes and sub-themes should be generated for discussion. The arguments should be discussed along with the evidences from the data and the discussion should be substantiated with the appropriate tables, figures, charts etc.

The thesis format will be provided by the department that will include the following components:

Preliminaries and front matters:

- Cover Page
- Declaration
- Recommendation For Acceptance
- Recommendation For Evaluation
- Evaluation And Approval

- Dedication
- Acknowledgements
- Abstract
- Table Of Contents
- List Of Tables And Charts
- List Of Abbreviations And Symbols

Body of the Thesis

Chapter One: Introduction

- Context or background of the research
- Review of literature: Thematic review and empirical review
- Objectives
- Research questions
- Significance of the research

Chapter Two: Methodology

- Research design
- Research sample
- Research instrument(s)
- Data collection procedures
- Limitation/delimitation

Chapter Three: Analysis and Discussion - Thematic discussion of the data.

Chapter Four: Findings, conclusions and implications

References in APA style

Appendices

- Research tools
- Sample data

Stage Five: Post Research Phase

This is the stage in which the students will present their thesis findings to the panel of experts. When the final draft of the thesis is ready, it should be submitted to the department through the supervisor and the department will assign an external examiner to assess the research work. After the evaluation, the department will conduct a viva voce in which the student will have to present the summary of the thesis. The experts panel will provide comments and feedback. The student will have to submit the final version of the thesis to the department incorporating all the comments and feedback.

3. Evaluation Scheme

3.1. Internal Examination (Proposal development) 40%

- Background reading and topic selection 5%
- Review of literature 10%

- Research design and inquiry process 5%
- Proposal viva voce 20%

3.2. External Examination (Thesis work and viva voce) 60%

- Language 7%
- Layout 5%
- Time 3%
- Methodology 5%
- Analysis and discussion 10%
- Conclusion and implications 5%
- Citations and references 5%
- Viva voce 20%

References

1) American Psychological Association. (2010). *Publication manual of the American Psychological Association (6th ed.)*. Washington, DC: APA.
2) Bitchener, J. (2010). *Writing an applied linguistics thesis or dissertation*. London: Palgrave Macmillan.
3) Blakeslee, A. & Fleischer, C. (2007). *Becoming a writing researcher*. London. Lawrence Erlbaum Associates, Publishers.
4) Burns, A. (1999). *Collaborative action research for English language teachers*. Cambridge: CUP.
5) Cohen, L., Manion, L. & Morrison, K. (2010). *Research methods in education (6th edition)*. London: Routledge.
6) Dornei, Z. (2007). *Research methods in applied linguistics*. Oxford: OUP.
7) McDonough, J. & McDonough, S. (2008). *Research methods for English language teachers*. London: Hodder Arnold.
8) Mckay, S.L. (2006). *Researching second language classrooms*. New Jersey: Lawrence Erlbaum Associates.
9) Nunan, D. (2008). *Research methods in language learning*. Cambridge: Cambridge University Press.
10) Richards, K. (2003). *Qualitative inquiry in TESOL*. New York. Palgrave Macmillan.
11) Sealey, A. (2010). *Researching English language*. London. Routledge.