Tribhuvan University

Faculty of Education

Three Semesters

M.Ed. Science Education
Second and Third Semester
Curriculum

Faculty of Education
Office of the Dean

2078 B.S. (2021)

List of Subjects

Three-Semester M. Ed. in Science Education

(ODL/Online Mode)

Second and Third Semester Courses

Semester	Nature Course	Course Code	Course Title	Credit Hours	Total
Second Semester	Core Courses	Ed.551	Measurement and Evaluation in Education	3	12
		Ed. 552	Educational Research	3	
	Specialization	Sc. Ed. 555	Advanced Science Education	3	
	Elective Specialization (Any one)	Sc. Ed. 556	Teaching Physics	3	
		Sc. Ed. 557	Teaching Chemistry		
		Sc. Ed. 558	Teaching Biology		
		Sc. Ed. 559	Teaching Environment		
Third Semester	Specialization	Ed. 601	Teaching Practice	6	12
		Sc. Ed. 602	Thesis	6	

Core Courses

Ed. 551: **Measurement and Evaluation in Education**

Course No.: Ed. 551 | Nature of the course: Theoretical

Level: Third-Semester M. Ed. | Credit hours: 3.

Semester: Second | Teaching hours: 48

1. Course Description

Measurement and Evaluation in Education is a professional core course designed for the master's degree students and will be conducted online. In general, this course deals with the nature of educational measurement and evaluation and their application to students' assessment learning in the formal educational setting. In specific, this course provides knowledge and skills in preparing tools and applying them to testing students' learning with a special focus on reliability and validity of a test, standardization of a test, measuring complex achievement, and intelligence and standardized achievement tests. This course aims to enable the students to develop, standardize and use tests for assessing students' learning which is an integral part of the teaching learning process in the classroom.

2. General Objectives

The general objectives of this course are as follows:

- To provide a general overview of educational measurement and assessment,
- To acquaint the students with the major considerations of reliability and validity,
- To develop skills in computation and estimation of reliability and validity in the students,
- To acquaint the students with the need for measuring higher-level and complex learning achievements
- To equip them with skills required for measuring complex achievement in education,
- To provide them with knowledge and hands-on skills in preparing tests and standardizing them,
- To acquaint them with the selected intelligence tests and standardized achievement tests.

3. Specific Objectives and Contents

Unit I: Educational Measurement and Evaluation (8)	
Specific Objectives	**Contents**
• Explain the meaning of educational measurement, assessment and evaluation, • Show relationship between test, measurement and evaluation, • Differentiate between psychological measurement and physical measurement, • Indicate the various scales of measurement, • Explain the problems of measurement, • Explain the current trends in educational measurement, • Differentiate between norm reference test and criterion reference tests, • Explain the relationship between evaluation and the instructional process.	**1. Educational Measurement and Evaluation** 1.1 Meaning of test, measurement and evaluation and relationship between them 1.2 Types of measurement used in education 1.2.1 Psychological measurement 1.2.2 Physical measurement 1.3 Scales of measurement – nominal scale, ordinal scale, equal interval scale and ratio scale 1.4 The general problems of measurement in education 1.5 Current trends in educational measurement 1.5.1 'High stakes' testing 1.5.2 Performance and portfolio assessment 1.5.3 Technological advances in testing 1.5.4 National assessment of students' achievement 1.6 Norm reference test vs. criterion reference test 1.7 Relationship between evaluation and instruction.
Learning engagement	
Roles of the Facilitator	**Roles of the students**
• Provide learning materials to the students, • Teacher will provide a project work to explore assessment practices at schools, • He/ She create an online discussion forum for delivering and clarifying the contents.	• Read and reflect on the reading materials, • Take part in the online discussion forum and discuss the issues related to the reading materials, • Share the study report about the assessment practices in schools.

Unit 2 Validity and Reliability of a Test (10)	
Specific objectives	**Contents**
• Explain the meaning of reliability, • Compute reliability using the various methods, • Explain the factors influencing reliability, • Explain the major considerations in validation, • Interpret validity coefficients, • Explain the factors influencing validity, • Show relationships between reliability and validity, • Explain the concept and use of the standard error of measurement, • Compute the standard error of measurement.	**2. Validity and Reliability of a Test** An Overview of reliability 2.2 Methods of estimating reliability with computation 2.2.1 The test-retest method 2.2.2 The equivalent forms method 2.2.3 The split half method 2.2.4 The kuder-Richardson method 2.2.5 The interrater consistency method 2.2.6 The interpreting reliability coefficients 2.3 Factors influencing reliability measures 2.4 An overview of validity 2.5 Major considerations of validation 2.5.1 Content consideration 2.5.2 Construct validation 2.5.3 Test-criterion relationship 2.5.4 Consideration of consequences 2.6 Interpreting validity coefficients 2.7 Factors influencing validity 2.8 Relationship between reliability and validity 2.9 The standard error of measurement 2.9.1 Concept 2.9.2 Use of the standard error of measurement 2.9.3 Computing the standard error of measurement
Learning engagement	
Roles of the facilitator	**Roles of the students**
• Provide self-learning materials to students, • Create the online discussion forum for clarifying the contents.	• Read and reflect on the reading materials, • Students take part in the online discussion forum and discuss the issues related to reading materials,

• Provide a set of achievement scores and ask the students to compute the reliability coefficient and interpret the findings.	• Compute the reliability coefficient, analyze and interpret the results and share the results.

Unit 3 : Measuring Learning Achievement of students (10)	
Specific objectives	**Contents**
• Discuss the need for the measuring higher learning abilities of students, • Explain the concept of the interpretive exercise, • Construct the various forms of interpretive exercises, • Assess the advantages and limitations of the interpretive exercise, • Construct the various forms of essay questions, • Explain the advantages and limitations of essay questions, • Prepare scoring criteria for essay questions, • Suggest ways of improving scoring essay questions, • Construct the various types of performance assessment, • Explain the advantages and limitations of performance assessment, • Describe the guidelines for developing portfolios, • Workout the strengths and weaknesses of portfolios,	**3. Measuring learning achievement of students** 3.1 Measuring complex achievement: Interpretive exercises 3.1.1 Concept of interpretive exercises 3.1.2 Forms and uses 3.1.3 Advantages and limitations 3.2 Essay questions 3.2.1 Forms and uses of essay questions 3.2.2 Suggestions for writing essay questions 3.2.3 Advantages and limitations of essay questions 3.2.4 Essay scoring criteria 3.2.5 Suggestions for scoring essay questions 3.3 Performance-based assessment 3.3.1 Concept 3.3.2 Types of performance assessment 3.3.3 Advantages and limitations of performance assessment 3.3.4 Suggestions for constructing performance tasks 3.4 Portfolios 3.4.1 Concept and purposes of portfolios 3.4.2 Guidelines for developing portfolio 3.4.3 Strengths and weakness of the portfolio assessment 3.5 Grading and reporting 3.5.1 Formal and informal evaluation 3.5.2 Functions of grading and reporting systems

• Explain the functions and types of grading and reporting, • Prepare a letter grading system for the course,	3.5.3 Types of grading and reporting system 3.5.4 Multiple grading and reporting systems 3.5.5 Assigning letter grades 3.5.6 Conducting a parent-teacher conference
Learning engagement	
Roles of the facilitator	**Roles of the students**
• Provide self-learning materials to the students, • Ask them to prepare essay questions from a subject taught in schools and ask them to administer then in a school and analyze the results, • Create an online discussion forum for clarifying the contents.	• Read and reflect on the reading materials • Prepare the essay questions, try them out in a school and analyze the results. The final essay questions will have to be shared among the students in their group • Take part in the online discussion forum and discuss the issues related to the reading materials.
Unit 4: Standardization of a Test (8)	
Specific Objectives	**Contents**
• Explain the concept and uses of the standardized test, • Describe the characteristics of the standardized test, • Plan for preparing the standardized test, • Prepare the preliminary format of the test, • Compute item analysis, • Prepare the final form of the test, • Administer the final form of the test and determine the reliability and validity of the test, • Prepare a test manual.	**4. Standardization of a test** 4.1 Concept and uses of the standardized test 4.2 Characteristics of the standardized test 4.3 Planning the standardized test 4.4 Preparing the preliminary format 4.5 Tryout of the test 4.6 Item analysis 4.6.1 The item difficulty index and the discrimination index 4.6.2 Distracter analysis 4.6.3 Using item analysis for improving test items 4.7 Preparing the final form of the test 4.8 Administration of the final form of the test 4.8.1 Determining validity 4.8.2 Determining reliability 4.8.3 Norms – raw scores, age norms, grade

	norm, percentile norms and standard scores. 4.9 Preparation of a test manual
Learning engagement	
Roles of the facilitator	**Roles of the students**
• Provide self-learning materials to students, • Ask the students to prepare a multiple choice test from a subject taught in school and try them out in a school, and carry out the item analysis of each of the items, • Create an online discussion forum for clarifying the contents.	• Read and reflect on reading materials • Prepare multiple-choice questions; try them out in a school and compute the difficulty level and discrimination index of each item and analyze the power of each distractor of each item. • Participate in the online discussion forum and discuss the issues related to the reading materials.
Unit 5 : Intelligence and the Standardized Achievement Test	**(12)**
Specific Objectives	**Contents**
• Explain the meaning of intelligence, • Discuss the meaning of intelligence in relation to age and sex difference, • Explain the meaning of intelligent quotient, • Differentiate between individual and group intelligence tests, • Explain briefly the early editions of the SB intelligence scale, • Describe the characteristics and psychometric properties of the modern SB scale (5th edition), • Explain the concept and uses of standardized achievement test,	**5. Intelligence and standardized achievement test** 5.1 Concept of intelligence 5.2 Facts about intelligence 5.2.1 Intelligence and age 5.2.2 Intelligence quotient 5.2.3 Intelligence and sex differences 5.2.4 Heredity and intelligence 5.3 Stanford-Binet (SB) Intelligence Tests (general introduction and 2003 fifth edition) 5.4 The standardized achievement test 5.4.1 Concept and uses of the standardized achievement test 5.4.2 A brief review of the Stanford Achievement Test (SAT)

• Introduce briefly the Stanford Achievement Test (SAT).	
Learning engagement	
Roles of the facilitator	**Roles of the students**
• Provide self-learning materials to the students. • Provide sets of the Standard-Binet Achievement Test and the Stanford Achievement Test, and ask them to review and prepare a summary report them • Create an online discussion forum for clarifying the contents.	• Students will read and reflect on reading materials. • Students will review the Standard-Binet Achievement Test and Stanford Achievement Test and prepare a summary report on it. This report will be a part of their internal assessment. • Students take part in online discussion forum and discuss the issues related to reading materials.

Note: The figures in the parentheses indicate the approximate teaching hours needed for the respective units.

4. Evaluation

Nature of the course	Internal Assessment	Semester Examination	Total Marks
Theory	40 Marks	60 Marks	100 Marks

Note: The Students will have to pass separately in the internal assessment and the semester examination.

4.1. Internal Evaluation (40 Marks)

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

1.	Attendance	5 marks
2.	Students learning engagement	5 marks
3.	Assignment I	10 marks
4.	Assignment II	10 marks
5.	Assignment III	10 marks
	Total	**40 Marks**

Note: Facilitator can decide assignments according to the nature of subject, which might be, project work and presentation, webinar, review book or article or dissertation or documents, case study, designing modules / lessons, survey/field study and individual/group report writing and presentation, term exam etc

4.2.External Evaluation (Final Examination) (60 Marks)

The examination Division, Office of the Dean, Faculty of Education will conduct the final examination at the end of the semester. The marks distribution will be as follows

1.	Objective type questions (Multiple choice questions 10 x 1mark)	10 Marks
2.	Short answer questions (6 questions with 2 or questions x 5 marks)	30 Marks
3.	Long answer questions (2 questions with 1 or questions x 10 marks)	20 Marks
	Total	**60 Marks**

Note: The marking system will be changed into the CGPA system as per the rule and regulation of the Academic Council, Tribhuvan University.

Recommended books and references

Recommended books

Gregory, R. J. (2005). *Psychological testing: History, principles, and applications.* (4th ed.) Delhi: Pearson Education Pte. Ltd. **(For unit 5)**

Kubiszyn, T., & Borich, G. (2004). *Educational testing and measurement: Classroom application and practice* (7th ed.) India: John Wiley & Sons, Inc. **(For units 1, 2 and 4)**

Linn, R. L. & Gronlund, N. E. (2003) *Measurement and assessment in teaching.* (8th ed.), India: Pearson Education. **(For units 1, 2, 3 and 4)**

Reynolds, C. R. et.al. (2009). Measurement and assessment in education. (2nd ed.) New Delhi: PHI Learning Pvt. Ltd. **(For units 1, 2, 3, and 4)**

Sharma, R. A. (2004). Essentials of measurement in Education and psychology. Meerut: R. Lall Book Depot. **(For units 1, 2 and 5)**

Sidhu, K. S. (2005). *New approaches to measurement and evaluation.* New Delhi: Sterling Publishers Pvt. Ltd. **(For units 1and 4)**

Recommended references

Ebel,, R. L. & Frisbie, D. A. (1991). *Essentials of educational measurement* (5th ed.). New Delhi: Prentice-Hall of India Pvt. Ltd.

Patel, R. N. (2005), *Educational evaluation theory and practice*, (6th ed.), Mumbai, India: Himalaya Publishing House Pvt., Ltd.

Singh, A. K. (1997). *Tests, measurements and research methods in behavioural Sciences.* (2nd ed.) India: Bharati Bhawan Publishers and Distributors.

Swain, S. K., Pradhan, C., & Khatoi, P. K. (2005). *Educational measurement statistics and guidance.* (2nd ed.) New Delhi, India: Kalyani Publishers.

Ed. 552: **Educational Research**

Course No.: Ed. 552 | Nature of Course: Theoretical

Level: Three Semester M.Ed. | Credit Hours: 3

Semester: Second | Total teaching hours: 48

1. Course Description

'Research Methodology in Education' is a core course aiming to prepare the students for carrying out original research in the field of education using an appropriate research design and tools. This course provides the students with the basic concepts, knowledge and skills of research methodology, with the goal of making them familiar with different types of research design, methods and tools. It also aims at equipping with the knowledge and skills needed for doing research in the quantitative, qualitative and mixed method designs. Students will be able to choose appropriate sampling techniques, prepare data collection tools, do fieldwork and analyze data with the ethical aspects of research in mind. In addition, this course helps them to develop in-depth knowledge and skills required for developing research proposals and conducting research using quantitative, qualitative and mixed methods, and the action research design, and writing reports on them.

2. General Objectives

The general objectives of this course are as follows:

- To make the students familiar with the basic concepts of research and educational research,
- To acquaint them with quantitative, qualitative, mixed methods and the action research designs, and help them choose appropriate design for doing research,
- To equip them with necessary skills needed for analysing and interpret quantitative and qualitative data,
- To enable them to prepare a research proposal using an appropriate design. and
- To provide them with the knowledge and skills required for writing research report in the APA format.

3. Specific Objectives and Contents

Specific Objectives	Contents
	Unit 1: Concept of Research (10)
• Explore the meaning of research and educational research, • Explain the meaning of variables and scales of measurement used in educational research , • Select appropriate research problems from their discipline, • Prepare objectives, research questions and hypothesis suitable for the choice of their research design, • Explain the meanings of limitations and delimitations of educational research, • Review the related literature, and prepare a theoretical and/or conceptual framework suitable for their research.	1.1 Concepts of research and educational research 1.2 Variables and scales of measurement used in research 1.3 Research problems 1.3.1 Sources of the research problem 1.3.2 Identifying, defining, analyzing and stating research problems 1.4 Research objectives 1.5 Research questions 1.6 Hypotheses 1.7 Limitations and delimitations in research 1.8 Review of the related literature 1.9 Theoretical framework and conceptual framework

Learning Engagement

Roles of the facilitator:	**Roles of the students:**
1. Provide learning resources such as papers, books, video/URL link, recorded video, and Power Point slides, 2. Provides discussion questions, 3. Encourage the students for interactive learning and provide timely feedback on the answers during the discussion, 4. Provide themes to the students	1. Access the learning resources (papers, books, video/URL link, recorded video, and Power Point slides) through the moodle or email 2. Actives discuss at least two conceptual questions 3. Respond to the questions 4. Student online/ vedio presentation (10 minutes) on the themes provided 5. Do assignment I

and arrange for video presentation for the students, 5. Create online presentations and provide feedback on the students' presentation.	

Assignment I: Select a research issue and introduce it. Construct the statement of the problem of your research. Based on the problem statement, formulate your research purpose and research questions. Develop hypotheses if you plan to conduct quantitative research.

	Unit 2: Quantitative Research (20)
• Explain the meaning and characteristics of quantitative research, • Select appropriate sampling strategies in quantitative research, • Construct and validate different types of tools for data collection in quantitative research, • Select the appropriate quantitative design for the research, • Explain and use different approaches and processes of data analysis and interpretation suitable for quantitative research, • Explain and use different ethical issues related to quantitative research.	2.1 Characteristics of quantitative research 2.2 Sampling strategies in quantitative research 2.3 Data collection tools commonly used in quantitative research 2.3.1 Questionnaire 2.3.2 Attitude scale 2.3.3 Interview schedule 2.3.4 Rating scale 2.3.5 Test 2.4 Quantitative research designs 2.2.1 The survey (cross-sectional and longitudinal) 2.2.2 Ex-post facto 2.3.3 Correlational 2.3.4 Experimental (pre, true and quasi) 2.5 Quantitative data analysis 2.6 Ethical issues in quantitative research

Learning Engagement

Roles of the facilitator	**Roles of the students**
1. Provide learning resources such as	1. Find the learning resources (papers, books,

papers, books, video/URL link, recorded video, and Power Point slides, 2. Provide at least long quiz questions, 3. Provide self-testing keys to the quiz questions, 4. Give the themes to the students and arrange for online presentation for the students, 5. Give online presentations and provide feedback on the students' presentations.	video/URL link, recorded video, and Power-Point slides) through them moodle or email 2. Respond the objective type questions and test the responses 3. Take participate students' online presentations (10 minutes each) on the themes provided 4. Do Assignment II

Assignment II: Review a theory is association with your research problem, themes associated with your research issue, relevant empirical studies (at least three latest ones), and policies (if applicable).

	Unit 3: Qualitative Research (8)
• Distinguish between quantitative and qualitative research with appropriate examples, • Explain and select appropriate sampling strategies suitable for qualitative research, • Select an appropriate design for qualitative research, • Describe and use the qualitative data collection techniques ,, • Illustrate the basic steps of qualitative data analysis • Discuss the ways of maintaining ethics, quality and rigour in qualitative data	3.1 Characteristics of qualitative research 3.2 Sampling strategies in qualitative research 3.3 Collection and analysis of qualitative data 3.3.1 Techniques of collecting qualitative data 3.3.1.1 In-depth interview 3.3.1.2 Participant observation 3.3.1.3 Focus group discussion (FGD) 3.3.2 Maintaining trustworthiness and rigor in qualitative data 3.4 Qualitative research designs 3.4.1 Ethnography 3.4.2 Narrative inquiry 3.4.3 Case study

	3.4.4 Grounded theory 3.4.5 Phenomenology 3.5 Data analysis and ethical considerations in qualitative research
Learning Engagement	
Roles of the facilitator	**Roles of the students**
1. Provide learning resources such as papers, books, video/URL link, recorded video, and Power-Point slides, 2. Deliver a few discussion questions to the students, 3. Encourage the students for interactive learning and provide timely feedback on the answers brief discussion, 4. Provide themes to the students and arrange for online presentation for the students, 5. Give a online presentation and provide feedback on students' presentations,	1. Access the learning resources (papers, books, video/URL link, recorded video, and Power-Point slides) through the moodle or email 2. Actively engage in discuss at least two conceptual questions 3. AlterNet students online presentation (10 minutes each) on the themes provided 4. Do assignment III
Assignment III: Thin of a research area of your interest which specific research methodology(s) do you plan to apply your research? Why? Describe your study site, population and sampling (in quantitative research)/select on of participants (if qualitative research).	
	Unit 4: Mixed Method and Action Research (5)
• Explain the basic characteristics of the mixed method research and the rationale for using this approach, • Discuss the different types of the mixed method research, • Explain steps in conducting mixed	4.1 Rationale for using the mixed method research 4.2 Characteristics of the mixed method research 4.3 Types of the mixed method research design 4.3.1 Concurrent/convergent design 4.3.2 Sequential design 4.3.3 Embedded design

method research, • Highlight the characteristics, types and examples of action research appropriate in education, • Conduct action research following through its logical steps.	4.4 Action research 4.4.1 Concept and characteristics of action research 4.4.2 Practical and participatory action research 4.4.3 Steps in conducting action research
Learning Engagement	
Roles of the facilitator 1. Provide learning resources (e.g. papers, books, video/URL link, recorded video, and Power-Point slides to the students, 2. Distribute a few quiz questions to them, 3. Provide the self-testing keys to the quiz questions 4. Deliver the themes to the students and arrange for viewer online presentations, 5. Give online presentation and provides feedback on students' presentations.	**Roles of the students** 1. Access the learning resources (papers, books, video/URL link, recorded video, and Power-Point slides) through the moodle or email 2. Actively respond to ten of the objective type questions and test the responses 3. Participate students' in the online presentations (10 minutes each) on the themes provided 4. Do Assignment IV
Assignment IV: Discuss the specific data collection method/s that you plan to use in your proposed research. Discuss the tool/s you will be using in the research. What specific approaches/steps will you use to analyze and interpret your data? What possible quality and ethical standards will you incorporate in your research study? Discuss.	
	Unit 5: Proposal and Report Writing (5)
• Provide the rationale for writing a research the proposal, • Explain the essential components a of research proposal and prepare a proposal in their discipline,	5.1 Rationale for writing a research proposal 5.2 Components of a research proposal 5.3 Essentials of report writing 5.3.1 Professionalism 5.3.2 In-depth knowledge

• Describe the essential skills and steps of writing a research report, • State the components of a research report/thesis, • Use the APA format in preparing a proposal and report writing.	5.3.3 Concentration 5.3.4 Writing skills 5.4 Writing a research report using the APA style (structure and formatting) 5.5 Referencing and citation (using the APA format) 5.6 Format and components of research report/thesis (as prepared by FOE, Dean's Office)
Learning Engagement	
Roles of the facilitator	**Roles of the students**
1. Deliver learning resources such as papers, books, video/URL link, recorded video, and Power-Point slides to the students, 2. Prepare and distribute discussion questions to the students, 3. Encourage to the students for interactive learning and provide timely feedback on answers during the discussion, 4. Provide themes to the students and arrange online presentations for the students, 5. Give a online presentation and provide feedback on the students' presentations.	1. Access the learning resources (papers, books, video/URL link, recorded video, and Power-Point slides) through the moodle or email 2. Actively take part in discussing at least two conceptual questions 3. Participate the students' online presentation (10 minutes for each) on the themes given 4. Do Assignment V
Assignment V: Organize the tasks that you have done in earlier assignments and develop a coherent research proposal.	

4. Evaluation

Nature of the course	Internal Assessment	Semester Examination	Total marks
Theory	40 marks	60 marks	100 marks

Note: Students will have to pass separately in the internal assessment and the semester examination.

4.1. Internal Evaluation (40 marks)

The internal evaluation will be conducted by course facilitator based on following indicators:

1.	Attendance (Contact session and discussion forums)	5 marks
2.	Students' learning engagement	5 marks
3.	Assignment I	10 marks
4.	Assignment II	10 marks
5.	Assignment III (Project work/review books/journal articles/dissertations)	10 marks
	Total	**40 marks**

4.2.External Evaluation (Final Examination) (60 marks)

The examination Division, Office of the Dean, Faculty of Education will conduct the final examination at the end of the semester. The marks distribution will be as follows:

1.	Objective type question (Multiple choice questions 10 x 1mark)	10 marks
2.	Short answer questions (6 questions with 2 or questions x 5 marks)	30 marks
3.	Long answer questions (2 questions with 1 or questions x 10 marks)	20 marks
	Total	**60 Marks**

Recommended Books and References

American Psychological Association.(2009). *Publication manual of American Psychological Asssociation.*(6th ed.). Washington, DC: APA. **(For unit V)**

Cohen, L., Manion, L., & Morrioson, K., (2010). *Research methods in education.* Noida, India: Sirohi Brothers. **(For Units II, III, IV).**

Creswell, John W. (2011). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research.* (4th ed.). New Delhi: PHI Learning Pvt. Ltd. **(For Units I, II, III, & IV)**

Flick, U. (2006). *An introduction to qualitative research* (3rd ed.). Los Angeles Sage Publication. **(For Unit III)**

Kerlinger, F.N.(1983). *Foundations of behavioral research.* New York: Holt Rinehart and Winston, Inc. U.S.A. **(For Units- I, & II)**

Lodico, M.G., Spaulding, D.T. and Voegtle, K.H. (2006). *Method in educational research: From theory to practice.* San Francisco, USA: Jossey-Bass: **(For Unit II, III and V)**

Mack, N., Woodsong, C., Mac Queen, K. M., Guest, G., & Nancy, E.(2005). *Qualitative research methods: A data collector's field guide.* California: USAID, Family Health International. **(For units-II, & III)**

Pelton, R.P. (Ed) (2010). *Action research for teacher candidates: Using classroom data to enhance instruction.* Maryland: Association of Teacher Educators. **(For unit IV)**

Punch, K. (20000. *Developing effective research proposal.* London Sage Publication. **(For unit V)**

Best J.W., & Kahn J. V.(2012). *Research in education.* New Delhi: Prentice Hall of India Pvt. Ltd.

Elliott, J. (1991). *Action research for educational changes.* Buckinggham: Open University Press

Koul, L., (2009). *Methodology of educational research.* New Delhi: Vikash Publishing House Pvt. Ltd.

Denzin, N. K., & Lincoln, Y. S. (Eds.). (2000). *Handbook of qualitative research.* London: Sage Publication.

Hancock, B. (2002). *An introduction to qualitative research.* Nottingham: Trent Focus Group.

Van Dalen, B. & Mayer, W. J.(1966). *Understanding educational research: An introduction.* California: Mc Graw-Hill Series in Education.

Specialization Course

Sc. Ed. 555 : Advanced Science Education

Course code: Sc. Ed. 555
Level: Three Semester M. Ed.
Semester: Second

Nature of the course: Theoretical
Credit hours: 3
Teaching hours: 48

1. Course Description

This course is designed to acquaint the students with the knowledge and skills of advanced science education through the distance mode. The course further aims at developing attitudes, knowledge, skills and aptitudes necessary for promoting the scientific perspective. The development perspectives of science, constructivism, concept mapping of science education, collaborative classrooms, use of ICT in science education and research are the domains of this course.

2. General Objectives

The general objectives of the course are

- To develop planning skills to prepare lesson modules based on the constructivist approach, concept mapping and classroom-based activities,
- To equip the students with different teaching/learning techniques application to the classroom situation,
- To analyze science concepts with multiple perspectives and creative ideas,
- To develop skills and methods of science with their application to the cognitive development of students.

3. Specific Objectives and Contents

Specific Objectives	Contents
• Explain the concept of scientific paradigm and paradigm shift, • Elaborate the core tenets of pragmatism, • Discuss the theory of falsification and the progress of	**Units I: Developmental Perspectives of Science** **(10 Pds)** 1.1 Paradigm and paradigm shift 1.2 Falsification and progress of science 1.3 Pragmatism: Theory, truth and epistemology

science, • Explain the epistemology of realism in relation to science, • Explain the basic epistemology of realism in science education, • Explain the meaning of pragmatism, • Discuss the epistemology of praxis in relation to science education, • Discuss the multiple perspectives of teaching science education.	1.3.1 The pragmatic maxim 1.3.2 Belief and habit 1.3.3 Pragmatism and education 1.3.4 Neo-pragmatism 1.4 Inquiry and inferential thinking 1.4.1 Methods of fixing belief 1. 4.2 Deduction and induction 1.5 Realism 1.5.1 Philosophical realism 1.5.2 Realism and education 1.5.3 Scientific realism

Note to the assignment and activities:

Students will be provided the learning materials on the related contents through email or handouts during the contact session. They will also be uploaded on the Moodle. The students will discuss in groups. The facilitator will facilitate the discussion and provide feedback. They have to critically review perspectives on theories of learning in relation to science education (physics, chemistry, biology and environment).

The following are the specific activities related to this unit.

- *Critically analyze the theories of learning and present them in the class.*
- *Analyze the existing science teaching and learning activities in the school and the university levels based on the different perspectives.*
- *Present the epistemological pluralism in-terms of realism, pragmatism and other perspectives and paradigms.*

• Explain the concept of constructivism and its types, • Describe the process and application of constructivism in the science education classroom, • Manage classroom dynamics to	**Units II: Constructivism in Science Education (8 Pds)** 2.1 Introduction to constructivism 2.2 Constructivism and the sociology of scientific knowledge 2.3 Constructivism and logic

facilitate the learning of science, • Explain the constructivist approaches as used in textbooks, curriculum and evaluation techniques, • Prepare lesson plans with activities based on the constructivist approach.	2.4 Constructivism and education: beyond epistemological correctness 2.5 Epistemological constructivism 2.6 Teaching within the constructivist mode: practices and promises 2.7 The philosophy of consciousness 2.8 The educational implications social constructivism
	2.9 The social constructivist classroom 2.10 Characteristics of the constructivist pedagogy in science education

Note to the assignment and activities:

Learning materials on constructivism will be provided to the students with facilitator through email or handouts during the contact session. The students will discuss in groups and the facilitator will facilitate the discussion with feedback. The self-learning packages of the research articles based on the constructivism approach will also be provided by the facilitators. The students will have to present in groups in the form of a webinar. Some specific activities for the facilitator from this unit are:

- *Develop Power Point slides based on the given topic/area and present in the class.*
- *Prepare the content for the discussion forum and implement in the class.*
- *Develop the quiz (at least 10 questions) and launch in the class.*

• Explain the concept map in-terms of theoretical approach, • Discuss the models of concept maps • Design science lessons using concept maps (word parking methods), • Apply concept maps to the evaluation of science lessons, • Develop articles on teaching and learning physics, chemistry and biology	**Units III: Concept Mapping in Science Education (6 Pds)** 3.1 Theoretical background 3.2 Development of concept maps (word parking method) 3.3 Models of concept maps 3.4 Application of concept maps 3.5 Development of science lesson using

based on concept map.	concept maps 3.6 Evaluation of science lessons using concept maps 3.7 Writing articles based on the concept map approach

Note to the assignment and activities:

The focus of the unit is to provide knowledge about the thinking process by analyzing the contents in a conceptual way. The students are also expected to deal with meta-cognitive skills. For this, they will be provided with the learning materials either through email or as handouts by the facilitators.

Do the following activities from this unit:

- *Prepare concept maps of different models based on the word parking method and present them in the class.*
- *Search research articles related to of concept maps in science education. Critically analyze the abstract and present it in the class.*
- *Prepare multiple choice questions (at least ten) and implement in the class.*

• Explain the concepts of collaborative and cooperative learning in science, • Discuss the different approaches to collaborative learning [such as Team games tournament (TGT), (Student Team Achievement Division (STAD), TAI (Team Assisted Individualization) and Jigsaw], • Illustrate the role of the teacher and the students in cooperative and collaborative learning in science education, • Critically appraise the use of collaborative and cooperative learning	**Units IV: A Collaborative Science Classroom (6 Pds)** 4.1 The theoretical view of cooperative and cooperative learning 4.2 The philosophical foundations of cooperative learning 4.3 The techniques and characteristics of collaborative learning 4.4 Rationale for cooperative learning 4.5 The teachers' roles in a collaborative classroom 4.6 Students' roles in a collaborative classroom 4.7 Challenges and conflicts in the collaborative classroom

in the science classroom.	

Note to the assignment and activities:

The focus of the unit is to learn the concept of science with collaborative and cooperative approaches. In this unit, the students are expected to learn the meaning and different approaches to collaborative and cooperative learning like STAD, TGT, TAI and Jigsaw. The students will be provided with the materials to learn by the facilitator and you will have to design cooperative and collaborative learning classrooms in contact session. Activities of this unit are as follows:

- *Bring case(s) from your classes; critically analyze one of them in terms of collaborative and cooperative learning strategies. And present it in the class.*

• Explain the role of science education for sustainable development, • Point out the different models of sustainable development, • Describe the three pillars of sustainable development, • Explain the concept of science education for all, • Review the given paper related to education for sustainable development from chemistry, biology and physics.	**Unit V: Science Education for Sustainable Development (6 Pds)** 5.1 Theoretical background 5.2 Sustainable development and science education 5.3 Models of sustainable development 5.4 Pedagogical orientation to the sustainable development 5.5 Three pillars of sustainability (social, environmental and economic) 5.6 Building knowledge and capacity for sustainable development 5.7 School gardening and sustainable science education

Note to the assignment and activities:

The focus of the unit is on reading a paper on a theme followed by a group discussion in order to clarify the complex aspects of sustainable development and science education pedagogy. The detailed activities will be presented on self-reading materials. The major activities are:

- *Critically analyze the role of science education to attain sustainable development goals*

in relation to biology, physics and chemistry teaching learning activities. • *Analyze the paper given and present the analysis in the class.* • *Prepare a report on science as a culture and importance of school gardening for learning science.*	
	Unit VI: ICT in Science Education (6 Pds)
• Explain how learning management system (LMS) is useful for teaching and learning science, • Use the Moodle as a LMS tool, • Illustrate how the web tools can be used for interaction and conferencing, • Explain and illustrate the measures on the use of ICT an integrated as means in teaching and learning science, • Develop ICT integrated teaching plans, • Use virtual field trips to teaching science.	6.1. Introduction to learning management system (LMS) and learning course management system (LCMS) 6.2. Course management using LMS and LCMS 6.3. Moodle: major features 6.4. Using web tools, video conferencing, webinar 6.5. ICT integrated unit planning and lesson planning 6.6. Web quest and virtual field trips: concept, process, and use in the classroom
Note to the assignment and activities: *Develop contents for managing the learning of chemistry/physics/biology/environment at the higher secondary level. Upload these contents in the Moodle for their discussion in your circle or design and develop three ICT integrated activities to teach physics/chemistry/biology at the secondary level and write up the report in 2000 words expressing your new experience of teaching these subjects. Also do the following:* • *Conduct a webinar based on the national and international issues related to science education, teaching and learning as well as science teachers' professional development activities.* • *Present the importance of webinars, virtual mode of lesson delivery and virtual field trips with examples.*	
	Unit VII: Research in Science Education (6 Pds)
• Develop a research proposal on a topic related to science education, • Explain the meaning and major aspects of participatory action research,	7.1 Science education based research proposal 7.2 Participatory action research

• Discuss the principles of the participatory action research methodology, • Describe the sources of data generation and analysis techniques related to participatory action research, • Explain the methodological approach to participatory action research in conducting science education research, • Conduct a seminar/webinar related on an issue of science education, • Review dissertations and articles related on science education (at least one article and one dissertation).	methodology in science education 7.3 Webinar on contemporary issues in science education 7.4 Review of dissertations and articles related to science education

Note to the assignment and activities:

The students will be guided on the writing procedure of a research proposal. They will discuss and develop the proposal in science education on the given format. They will conduct a webinar on the issues of science education and also review thesis and articles form science education journals. Also do the following activities:

- *Analyze the video clips and discuss in the class.*
- *Share the components of the research proposal and its components in the class.*
- *Critically analyze the research papers provided and present the analysis in the class.*
- *Develop the manuscripts of research papers and discuss through the online discussion forums:*

4. Instructional Techniques

4.1 General Techniques

- Online lecture and question-answer,
- Participatory activities,
- Inquiry: Generating questions and answers through dialogues,
- Internet search.

4.2 Specific Instructional Techniques

Units	Specific Instructional Techniques	Remarks
1	Review of articles and dissertations	

2	Book review	
3	Project work	
4	Paper manuscript preparation	
5	Virtual conference/webinar	
6	Online workshops and feedback sessions	
7	Virtual discussions, dialogue conferences and presentations	

Note: *The mode of delivering the course is online. A short presentation will be given before or after the activities by the facilitator and the teacher experts during the contact sessions about the overall course plan, time schedule, modes of lesson delivery, assessment systems, and so on.*

5. Evaluation

Nature of the course	**Internal Assessment**	**Semester Examination (Final)**	**Total Marks**
Theory	40 Marks	60 Marks	100 Marks

Note: *The students must pass separately in both internal assessment and semester examination.*

5.1 Internal Evaluation (40 Marks)

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

1.	Attendance (Contact session and discussion forums)	5 Marks
2.	Student learning engagement	5 Marks
3.	Assignment I	10 Marks
4.	Assignment II	10 Marks
5.	Assignment III	10 Marks
	Total	**40 Marks**

Note: The first assignment will take from presentations, quizzes, write ups and discussions. The second assignment will be based on the review of the dissertation/articles. The third assignment will relate to the preparation of the manuscript of the paper (at least one) to publish in national (Nepal Journals Online-NepJOL) or in international peer-reviewed journals.

5.2 External Evaluation (Final Examination) (60 Marks)

Examination Division, Office of the Dean, Faculty of Education will conduct the final examination at the end of the semester. The marks distribution will be as follows

1.	Objective type questions (Multiple choice question 10 x 1mark)	10 marks
2.	Short answer questions (6 questions with 2 'OR' Questions x 5 marks)	30 marks
3.	Long answer questions (2 questions with 1 'OR' Question x 10 marks)	20 marks
	Total	**60 Marks**

Recommended Books and References

Acharya, K. P. (2020). *Teaching of Science: A Contemporary Approach.* Intellectuals' Book Palace, Kathmandu. **(For all Units)**

Akpan, B. (2017). Science Education for Sustainable Development. In *Science Education* (pp. 493-504). Brill Sense. **(For Unit V)**

Barton, R. (2004). *teaching secondary science with ICT.* McGraw Hill International

Bhaskar, R. (2009). *Scientific realism and human emancipation.* Routledge. **(For Unit I)**

Chanady, A. B. (1985). *Magical realism and the fantastic: Resolved versus unresolved antinomy* (p. 12). New York: Garland. **(For Unit I)**

Dewey, J. (1923). *Democracy and education: An introduction to the philosophy of education.* Macmillan. **(For Unit I)**

Hmelo-Silver, C. E., Chinn, C. A., O'Donnell, A. M., & Chan, C. (Eds.). (2013). *The international handbook of collaborative learning*. Routledge. **(For Unit IV)**

Jacobs, G. M., & Renandya, W. A. (2019). *Student Centered Cooperative Learning: Linking Concepts in Education to Promote Student Learning.* Springer. **(For Unit IV)**

James, W., & Thayer, H. S. (1975). *Pragmatism* (Vol. 1). Harvard University Press. **(For Unit I)**

Jung, M., & Madzia, R. (2016). *Pragmatism and Embodied Cognitive Science: From Bodily Intersubjectivity to Symbolic Articulation.* **(For Unit I)**

Kahn, W. B., Best, W. John (2010). *Research in Education.* Prentice Hall of India, New Delhi, India. **(For Unit VII)**

Langhelle, O. (1999). *Towards sustainable development: on the goals of development-and the conditions of sustainability*. Springer. **(For Unit V)**

Leal Filho, W. (Ed.). (2009). *Sustainability at universities: opportunities, challenges and trends.* Lang. **(For Unit V)**

McAleese, R. (1998). *Coming To Know: The Role of the Concept Map: Mirror, Assistant, Master?* ERIC Clearinghouse. **(For Unit III)**

McTaggart, R. (Ed.). (1997). *Participatory action research: International contexts and consequences*. Suny Press. **(For Unit VII)**

Michael, W. A., Michael A. (2002), *Guide to E-Learning.* Wiley Publication, 2002. **(For Unit VI)**

Mohan, R. (2007). *Innovative science teaching*. Prentice hall of India, New Delhi. **(For Unit VII)**

Moon, B., Hoffman, R. R., Novak, J., & Canas, A. (Eds.). (2011). *Applied concept mapping: Capturing, analyzing, and organizing knowledge*. CRC Press. **(For Unit III)**

Pant, P. R. (2010). *Social Science Research and Thesis Writing.* **(For Unit VII)**

Pfadenhauer, M., & Knoblauch, H. (2018). *Social Constructivism as Paradigm: The Legacy of The Social Construction of Reality*. Routledge. **(For Unit II)**

Plowright, D. (2016). *Charles Sanders Peirce: Pragmatism and Education.* Springer Netherlands. **(For Unit I)**

Posner, R. A. (2005). *Law, pragmatism, and democracy*. Harvard University Press. **(For Unit VII)**

Selener, D. (1997). *Participatory action research and social change* (No. Ed. 2). The Cornell Participatory Action Research Network, Cornell University. **(For Unit VII)**

Semenov, A. (2005*). Information and Communication Technologies in Schools*. A handbook for Teachers. UNESCO. **(For unit VI)**

Singh, P. P., Sharma, S. (2005). *E-Learning: New Trends and Innovations,* New Delhi: Deep & Deep Publications. **(For Unit VI)**

Sood, J. K. (2009). *Teaching of science.* Prentice Hall of India, New Delhi. **(For Units I, II, III, IV)**

Steele, B. J., Gould, H., & Kessler, O. (Eds.). (2018). *Tactical Constructivism as Methods: Expression and Reflection.* Taylor & Francis. **(For Unit II)**

Turrisi, P. A. (1997). *Pragmatism as a principle and method of right thinking: The 1903 Harvard lectures on pragmatism.* **(For Unit I)**

van Eijck, M., & Roth, W. M. (2013). *Science Education for Sustainable Development.* In Imagination of Science in Education (pp. 165-175). Springer, Dordrecht. **(For Unit V)**

Veldhuis-Diermanse, A. E. (2002). *CSC Learning: participation, learning, activities and knowledge construction in computer-supported collaborative learning in higher education.* **(For Unit VI)**

Elective Specialization Course
(Any one)

Sc. Ed. 556: **Teaching Physics**

Course code: Sc. Ed. 556
Level: Three Semester M.Ed.
Semester: Second

Nature of the course: Theoretical
Credit hours: 3
Teaching hours: 48

1. Course Description

This course is designed to acquaint the students with the knowledge and skills of "Teaching Physics". The purpose of this course is to develop the professional Physics teacher with adequate pedagogical knowledge, better understanding of classroom practices and competence in various skills required for teaching, learning and evaluation in Physics. In addition, this course deals with understanding, analyzing, and seeking knowledge and skills relating to issues and trends of Physics education. Moreover, this course fundamentally covers methods of teaching Physics and Curriculum planning and Management in Physics education. It is expected that this course helps the students to be equipped with the integrated pedagogical knowledge and skills with technology to enhance their teaching and learning by creating new learning activities. The course also helps the students apply technology to the theoretical understanding, assessment, and use of technology to improve collaboration and efficiency by participating in the online and distance mode discussion and presentation.

This course contains six units which cover the broader area of contents relating to Physics teaching and learning approaches to the online and distance mode.

2. General Objectives

The general objectives of the course are as follows.

- To equip the students with the knowledge of the nature, values and scope of Physics education;
- To provide Physics education facilities to the students so as to practice Physics education as their life long activity;
- To provide effective alternative Physics learning approaches to wider opportunities in education especially in higher education;

- To provide Physics learning opportunities for the students to improve their knowledge in Physics education needed for their academic pursuits;
- To acquaint the students with Physics popularization in the modern age;
- To familiarize the students with the approaches in setting behavioral objective regarding Physics education;
- To acquaint the students with the structure of the Physics curriculum as schools and university;
- To develop competency in a critical analysis of the Physics curriculum, text books, journals and teachers' guide;
- To review the curriculum, textbooks and research articles related to Physics education;
- To acquaint the students with the scientific attitude and its strategies;
- To provide the students with an in-depth knowledge of modern methods, approaches and techniques as well as models for teaching and learning Physics;
- To develop skills needed for the development and application of instructional and supplementary materials in teaching learning Physics; and
- To develop knowledge and skills of planning, designing and managing Physics education classrooms and co-curricular activities.

3. **Specific Objectives and Contents**

Specific Objectives	Contents
• Outline the aims and objectives of teaching Physics • Discuss the interdisciplinary dimensions of Physics including correlation of Physics with social sciences, Chemistry, Mathematics, and Biology • Deal with the issues of Physics teaching and learning • Explore the uniqueness in	**Unit I: Nature of Physics and Philosophical Grounds (10 hrs.)** **A. Nature of Physics** **1.1** Aims and objectives of teaching Physics **1.2** Interdisciplinary dimension of Physics **1.3** Issues in teaching and learning Physics **1.4** Concepts and misconceptions in Physics **1.5** Indigenous knowledge in Physics learning **1.6** Physics for sustainable development **B. Philosophical Grounds** **1.7** Paradigm shift

teaching and learning Physics • Study on the misconceptions in Physics • Plan research and study on the indigenous dimensions of Physics. • Explain the importance of Physics for sustainable development • Discuss paradigm shift in physics education in the perspectives of – The mechanistic world views – The vitalist perspective – The holistic/ecological world view • Elaborate the contribution of the Kolb's learning cycle in Physics learning • Discuss the contribution of Ausubel's meaningful learning theory to learning Physics • Describe Bruner's concept of learning in-terms of enactive, iconic and symbolic representations in learning Physics • Elaborate the contribution of Bruner's concept learning to learning Physics • Discuss the importance of Howard Gardner's multiple intelligence modalities • Explore the types of multiple intelligences in learning Physics	• The mechanistic world views • The vitalism perspective • The holistic/ecological world view **1.8** Kolb's experiential learning **1.9** Ausubel's theory of meaningful learning **1.10** Bruner's theory of concept learning **1.11** Howard Gardner's multiple intelligences

Note on the assignments and activities:

Do the following tasks/activities.

- *Prepare a report on the application of Physics to daily life.*
- *Prepare a report on school and university-based issues of teaching learning Physics.*
- *Review the papers assigned.*
- *Critically review the learning theories given in-terms of teaching and learning Physics. Also, prepare a report based on this study*
- *Prepare journal articles within the areas of this unit.*
- *Carry out a mini research study on indigenous knowledge in Physics.*
- *Review the study on the perceptions and misconceptions of students in Physics deriving from daily life teaching and learning activities.*
- *Make a report on Paradigm shifts in Physics from the different perspectives.*

	Unit II: Physics Curriculum (6hrs.)
• Introduce physics curriculum and its components	2.1 Introduction
• Illustrate the features of competency-based Physics curriculum	2.2 Competency based Physics curriculum
• Analyze the curriculum of secondary level and the university level Physics curriculum	2.3 Analysis of secondary and university level Physics curricula
• Introduce the following innovative Physics education projects in-terms of their objectives, materials procedure, application and importance -Project Physics -PSSC Project -Nuffield Physics Project -Harvard Physics Project -U.K. project-Salter's advanced Physics	2.4 Innovative Physics projects 2.4.1 PSSC (Physical Science Study Committee Project) 2.4.2 Nuffield Physics project 2.4.3 Harvard Physics project 2.4.4 U.K. project- Salter's Advanced Physics.
• Elaborate the concept of STEM	2.5 STEM Literacy 2.5.1 STEM in school curriculum

literacy • Discuss the needs, features and design of STEM in the school curriculum	

Note on the assignments and activities:

Do the following tasks/activities.

- *Prepare a report on the issues of the different aspects of curriculum (e.g., curriculum development process, aspects of curriculum) and organize an online discussion session.*
- *Prepare a report analyzing the secondary level Physics curriculum in terms of its structure, scope, objectives, organization and strategies. Also assess its strengths and weaknesses critically.*
- *Develop a brief report on international initiatives for improvement of Physics teaching and learning.*
- *Conduct a webinar on STEM Education in Nepal: Needs, Practices and Prospects*

• Explain the major paradigm shifts in teaching and learning Physics • Describe the modular approach in teaching Physics • Explore the benefits of creativity in teaching Physics • Illustrate the critical thinking approach to teaching and learning Physics • Elucidate the ideas of developing creativity among students in learning Physics • Mention the features of inquiry-based Physics teaching learning • Explain the ways of developing inquiry among students • Discuss various types of inquiry	**Unit III: Approaches in Physics Pedagogy (8hrs)** 3.1 Paradigm shift in teaching and learning Physics 3.2 Modular approach to teaching Physics 3.3 Creativity and critical thinking approach 3.4 Inquiry-based Physics learning 3.5 Project-based teaching learning 3.6 Context-based teaching of Physics 3.7 Concept mapping in Physics 3.8 Research based teaching in higher level Physics education 3.9 21st century skills 3.10 Open and Distance mode for teaching Physics

approaches • Describe the project-based teaching of Physics • Elucidate the idea of context based teaching learning in Physics education • Explain the theoretical and philosophical meaning of concept mapping and implication for Physics education teaching	
• Describe the meaning and importance of research-based teaching in higher level Physics • Explain the importance, challenges and opportunities of 21st century skills • Discuss the importance, challenges and opportunities of open and distance mode of learning in Physics education	

Note on the assignments and activities:

Do the following tasks/activities.

- *Prepare a sample module on the content of Physics.*
- *Apply different student-centered approaches to the preparation of model in Physics lessons.*
- *Design the concept map for teaching any topic of Physics*
- *Discuss the ideas of developing creativity among students in learning Physics.*
- *Review research articles related to the concept mapping strategy used in teaching physics and highlight their major findings*

• Describe the benefits of planning teaching lessons in Physics • Define unit planning and design a	**Unit IV: Planning and e-learning in Teaching Physics (8hrs)** 4.1 Benefits of planning in teaching Physics 4.2 Unit and lesson planning

unit plan based on a topic in Physics • To explain the strategies of planning Physics lessons • Illustrate the importance of lesson planning in Physics • Prepare lesson plan in Physics based on the following approaches: – Herbert approach, – ABC approach, – 5Es approach, – Constructivist approach – Project-based approach, – Problem solving approach • Develop an instructional module of a Physics lesson • Explain the programmed instructional module of teaching activities in Physics • Develop a programmed instructional module of a lesson in Physics • Assess the importance of the computer-assisted instruction • Elaborate the steps of integrating computers into the instructional process in Physics • Discuss about the virtual environment for teaching and learning Physics • Develop teaching materials using the simulation mode: Physics-PhET simulations	4.3 Designing a unit plan in Physics 4.4 Various approaches to designing the lesson plan – Herbert approach, – ABC approach, – 5Es approach, – Constructivist approach – Project-based approach, – Problem solving approach 4.5 Instructional module in Physics 4.6 Programmed instruction module in activities in Physics. 4.7 Computer Assisted Instruction (CAI) 4.8 Virtual environment for teaching and learning Physics 4.9 Simulation in teaching Physics. 4.10 Teaching Physics with the gaming mode 4.11 e-learning products: VLEs, LMSs, web based educational materials, videoconferencing

• Apply the gaming mode in teaching Physics • Critically analyze the importance of virtual learning environments such as VLEs, LMSs and digital educational materials for teaching and learning Physics • Apply videoconferencing in learning Physics • Explain the importance and use of Physics laboratory in the digital environment	

Note on the assignments and activities:

Do the following tasks/activities.

- *Prepare a unit plan for a topic of your choice in Physics and present it in a web conference.*
- *Prepare a lesson plan for teaching in Physics based on the ABC approach, 5E approach, project-based approach and problem-solving approach.*
- *Design self-learning Physics module.*
- *Design a programmed instruction module in Physics.*
- *Review research articles related to simulation in teaching Physics.*
- *Review research articles related to the effectiveness of gaming mode teaching strategy in the secondary level school Physics.*
- *Apply videoconferencing to learning Physics.*
- *Prepare a report on the CAI, CBT, PhET, VLEs and LMSs.*
- *Design a lesson of Physics using PhET.*
- *Manage learning resources in LMS.*

• Describe the Physics laboratory and its importance • Explain the basic characteristics of a good Physics laboratory • Develop the designs of the	**Unit V: The Physics Laboratory and Improvisation of Materials (8hrs)** 6.1 Introduction 6.2 Importance of the Physics Laboratory 6.3 Characteristics of a good Physics laboratory 6.4 Planning and designing of a Physics laboratory

models of Physics laboratory • List out the basic requirements of planning a Physics laboratory • Describe the criteria of laboratory management techniques • Develop the Physics laboratory skills • Point out the major causes of Physics laboratory accidents and suggest their safety measures • Use the virtual Physics laboratory for teaching and learning Physics • Illustrate the importance of the mobile Physics laboratory • Define and explain the construction and importance of improvised instructional aids • Improvise teaching aids in Physics	6.5 Laboratory management and its technique 6.6 Physics laboratory skills 6.7 Safety measures in the laboratory 6.8 Common accidents in a Physics laboratory and their remedies 6.9 Virtual Physics laboratory 6.10 Physics mobile laboratory 6.11 Improvisation of Physics teaching aids: Introduction, construction and importance

Note on the assignments and activities:

Do the following tasks/activities.

- *Draw various models of the Physics laboratory.*
- *Conduct a virtual meeting through the video to share the different aspects of Physics laboratory (e.g., characteristics, design, criteria of laboratory management).*
- *Design various models of the Physics laboratory.*
- *Conduct a Physics activities using the Virtual Lab.*
- *Conduct a survey on students' awareness about laboratory-based activities and accidents in Physics laboratory.*
- *Construct improvised teaching aids for Physics using locally available materials and upload a video in the Moodle and explain the working principles and procedure.*

	Unit VI: Evaluation (8hrs)
• Explore the relationships between objectives, learning experiences and evaluation • Explain the basis characteristics of good Physics test items • Differentiate between the norm referenced test (NRT) and criterion referenced tests (CRT)	8.1 Introduction 8.2 Relationships between objectives, learning experiences and evaluation 8.3 Characteristics of good Physics test items 8.4 Norm referenced test (NRT) and criterion referenced tests (CRT) 8.5 Physics theory and practical test items and their type
• Describe the importance of Physics theory test items and their type • Develop different models of Physics practical test items for high school and higher-level Physics courses • Prepare the specification grid based on the Physics courses • Construct standardized Physics test items • Describe the criteria of item analysis and use them for standardization of test items • Calculate the item difficulty and discrimination index of Physics test items. • Use the online testing system • Develop students' portfolio/ E-portfolio • Introduce the letter grading system • Develop rubrics for Physics knowledge and skills evaluation	8.6 Specification grid 8.7 Construction of test items based on the revised Bloom's taxonomy 8.8 Standardization and administration of a Physics theory test 8.9 Item analysis: Item difficulty, discrimination index and reliability measurement 8.10 Online testing system 8.11 Portfolio/ E-portfolio development 8.12 The letter grading system 8.13 Rubrics

Note on the assignments and activities:

Do the following tasks/activities.

- *Develop a model specification chart for Physics*
- *Design Physics theories test item from Physics lesson for different levels of cognitive domain and then administer and calculate the item difficulty and discrimination index.*
- *Construct a set of test items of physics theory based on the revised Bloom's taxonomy.*
- *Design online testing tools*
- *Design a rubric for evaluating knowledge and skills in Physics.*
- *Design E-portfolio of students*

4. Instructional Strategies

The instructional strategies will be of blended type including face to face contact sessions and online and distance mode interactions. The students will get ample opportunities to study self-learning materials (SLM) - books, articles and e-resources provided by the course facilitator. The students will be provided with the learning materials through different e-platforms like the Moodle. There will be regular interactions among the peers and with facilitator through virtual meetings/conferences. The students will have to read articles, review them, select specific areas and prepare journal article manuscripts for publication.

4.1 General Techniques

- Online lecture and question-answer
- Participatory activities
- Inquiry: Generating questions and answers through dialogues
- Internet search

4.2. Specific Instructional Techniques

Units	Specific Instructional Technique	Remarks
1	Document study, Debate, and manuscript writing	
2	Curriculum Review	
3	Workshop cum discussion	
4	Virtual conference	
5	Collaborative work	
6	Workshop, survey and report writing	

Note: The mode of delivering the course is online. A short presentation will be given before or after the activities by the facilitator and the teacher experts during the contact sessions about the overall course plan, time schedule, modes of lesson delivery, assessment systems, and so on.

5. Evaluation

Nature of the course	Internal Assessment	Semester Examination	Total marks
Theory	40 marks	60 marks	100 marks

Note: the students will have to pass separately in the internal assessment and the semester (final) examination.

5.1. Internal Evaluation (40 marks)

The internal evaluation will be conducted by the course facilitator based on following activities:

1.	Attendance	5 marks
2.	Students learning engagement	5 marks
3.	Assignment I	10 marks
4.	Assignment II	10 marks
5.	Assignment III	10 marks
	Total	**40 marks**

Note: The facilitator can decide on the assignments according to the nature of the subject. However, the major ones might be project work and presentation, webinar, review book or article or dissertation or documents, case study, designing modules / lessons, survey/field study and individual/group report writing and presentation, term paper, etc.

5.2.External Evaluation (Final Examination) (60 Marks)

The Examination Division, Office of the Dean, Faculty of Education will conduct the final examination at the end of the semester. The marks distribution will be as follows

1.	Objective type question (Multiple choice question 10 ×1mark)	10 marks
2.	Short answer questions (6 questions with 2 or questions × 5 marks)	30 marks
3.	Long answer questions (2 questions with 1 or question × 10 marks)	20 marks
	Total marks	**60**

Note: The marking system will be changed in the CGPA system as per the rule and regulation of the Academic Council, Tribhuvan University.

Recommended Books and References

Amos, S. &. Boohan, R. (2002). *Aspects of teaching secondary science: Perspective on practice.* New York & London: Routledge Taylor and Francis Group. **(For Unit 1)**

Baixin, Z. (2012). The building of network virtual laboratory for Physics teaching. *International Conference of MCSA, AISC 191* (pp. 241-246). China: Springer.

(For Unit - V)

Bilal, M., Asgher, M., Cheng, H., Yan, Y., & Iqbal, H. M. (2019). Multi-point enzyme immobilization, surface chemistry, and novel platforms: a paradigm shift in biocatalyst design. *Critical reviews in biotechnology, 39*(2), 202-219.

(For Unit - I)

Bjønness., B., & Kolstø, S. (2015). Scaffolding open inquiry: How a teacher provides students with structure and space. *NORDINA 11(3)*, 223-237. **(For Unit - III)**

Blandin, B. (2010). Learning Physics: a competency-based curriculum using modelling techniques and PBL approach. *Grope Cesi* (pp. 1-9). Paris, France: Research Gate.

(For Unit -II)

Bybee, R. W. (2010). *The teaching science: 21st century perspectives - PB283X.* UK: National Science Teachers Association - NSTA Press. **(For Unit - III)**

Chambers, D. (1993). Toward a competency-based curriculum. *Journal of Dental Education, 57*, 790-790. **(For Unit - II)**

Chaudhary, S., & Dey, N. (2013). Assessment in open and distance learning system (ODL): A Challenge. *Open Praxis, vol. 5 issue 3*, 207-216. **(For Unit - VI)**

Chiu, S. K., & Lee, J. (2019). Innovative experiential learning experience: Pedagogical adopting Kolb"s learning cycle at higher education in Hong Kong. *Cogent Education, 6*(1), 1644720. **(For Unit - I)**

CLEAPSE. (2009). *Designing and Planning Laboratories.* Brunel Science Park: CLEAPSE (Consortium of Local Education Authorities for the Provision of Science Equipment).**(For Unit - V)**

Dahal, B. K. (2021). *Teaching Physics: A New Trends and Issues to Real Life.* Bhaktapur, Nepal: Nisha Sharma.**(For All Units)**

da Silva, J. B. (2020). David Ausubel's theory of meaningful learning: an analysis of the necessary conditions. *Research, Society and Development*, *9*(4), 09932803. **(For Unit - I)**

Davar, M. (2012). *Teaching of Science.* New Delhi: PHI Learning Private Limited. **(For Unit- I, IV, V, V & VI)**

Diberardinis, L. J., Baum, J. S., First, M. W., Gatwood, G. T., & Seth, A. K. (2013). *Guidelines forlLaboratory design: Health, safety, and environmental considerations (4th ed.)* New York: Wiley Publications. **(For Unit - V)**

Duran, L., & Duran, E. (2004). The 5E Instructional Model: A Learning Cycle Approach for Inquiry-Based Science Teaching. *Science Education Review, 3(2)*, 49-58. **(For Unit - IV)**

Fuller, K., & Malvern, D. (2010). *Challenge and Change: A History of the Nuffield A-level Physics project.* UK: centaur.reading.ac.uk. **(For Unit - II)**

Gil-Perez, D., & Carrascosa, J. (1990). What to Do About Science "Misconceptions". *Science Education 74(5)*, 531-540. **(For Unit - I)**

Gupta, V. (2005). *Teaching and learning of science and technology.* New Delhi: Vikas Publishing House. **(For Unit-IV)**

Guskey, T. (2011). Five obstacles to grading reform. *Educational Leadership, 69(3)*, 16. **(For Unit - VI)**

Heiland, T. L. (2019). Kolb Learning Styles of dancers who do and don"t use dance notation compared to other fields. *Research in Dance Education*, *20*(2), 148-173. **(For Unit - I)**

Hofstein, A., & Lunetta, V. (1982). The role of the laboratory in science teaching: Neglected aspects of research. *Review of educational research, 52(2)*, 201-217. **(For Unit - V)**

Howarth, S. & Scott, L. (2014). Success with STEM: Ideas for the classroom, STEM clubs and beyond. Oxon: Routledge. **(For Unit II)**

Husaini, R., Ikhsan, Z., & Toran, H. (2019). A Comprehensive 21st Century Child Development through scientific process in early science. *Creative Education, 10*, 2784-2795. **(For Unit - II)**

Jafri, A. V. (1979). Design and development of physics curricula. *Physics Education, Volume 14 (2)*. **(For Unit- II)**

Jeong, E. J. (2015). *Physics of the new millennium birth of the new paradigm.* USA: Research Gate. **(For Unit - III)**

Juškaite, L. (2019). The Impact of the virtual laboratory on the hysics learning process. *International Scientific Conference. Volume V, May 24th -25th* (pp. 159-168). Latvia: Research Gate. **(For Unit - V)**

Karpudewan, M., Md.Zain, A. N., & Chandrasegaran, A. (2017). Overcoming students' misconceptions in Science. Singapore: Springer Singapore. **(For Unit - I)**

Lau, D. (2001). Analyzing the curriculum development process: Three models. *Pedagogy, culture and society, 9(1)*, 29-44. **(For Unit - II)**

Levine, M., Serio, N., Radaram, B., Chaudhuri, S., & Talbert, W. (2015).Addressing the STEM gender gap by designing and implementing an educational outreach chemistry camp for middle school girls. *Journal of Chemical Education, 92*(10), 1639-1644. **(For Unit 1)**

Lewis, J. L. (1976). *New trends in physics teaching.* France: The United Nations Educational, Scientific and Cultural Organization. **(For Unit - III)**

Lins, L. D., Coelho, M. C., Lins, S. V. S., da Silva Gomes, R., Melo, S. A., & Coelho, M. C. (2020). Indigenous intercultural physics teaching based on David Ausubel"s meaningful learning theory. *International Journal of Advanced Engineering Research and Science, 7*(3). **(For Unit - I)**

Mammi, H. K., & Ithnin, N. (2012). Competency based education (CBE) for IT security: towards bridging the gap. *INTERNATIONAL JOURNAL OF ENGINEERING PEDAGOGY (IJEP)*, 24-26. **(For Unit- II)**

Mohan, R. (2007). *Innovative science teaching.* New Delhi: Prentice-Hall of India Pvt. Ltd. **(For all Units)**

Moreira, M. A. (2008). Concept mapping and concept learning in physics. *AIP Conference Proceedings 173 (1)* (p. 218). USA: American instute of Physics. **(For Unit - III)**

Ornstein, A. (1993). Norm-referenced and criterion-referenced tests: An overview. *NASSP Bulletin, 77(555)*, 28-39. **(For Unit - VI)**

Paosawatyanyong, B., & Wattanakasiwich, P. (2010). Implication of physics active-learning in Asia. *Lat. Am. J. Phys. Educ. Vol. 4, No. 3*, 502-505. **(For Unit - III)**

Pell, H. (2019). Harvard Project Physics: The role of history in science curriculum. *History of book :Physics History*. **(For Unit - II)**

Pinner, R. (2014). What Is The Difference between an LMS and a VLE? *Learning Management Systems*. **(For Unit - IV)**

Pratama, R. S., & Mulyono, M. (2020). Student's mathematical connection reviewed from learning motivation in Advance Organizer Learning assisted by Schoology. *Unnes Journal of Mathematics Education*, *9*(1), 53-60.

(For Unit - I)

Rajapaksha, A., & Hirsch, A. S. (2017). Competency based teaching of college physics: The philosophy and the practice. *Physical Review Physics Education Research 13, 020130(12)* , 1-12. **(For Unit - II)**

Ramma, Y., Bholoa, A., Watts, M., & Nadal, P. S. (2017). Teaching and learning physics using technology: Making a case for the affective domain. *Education Inquiry, 9:2*, 210-236. **(For Unit - IV)**

Rao, A. (1993). *Teaching of Physics.* New Delhi: Anmol Publications.**(For all Units)**

Ronen, I. (2017). *Misconceptions in science education, (1st ed.).* UK: Cambridge Scholars Publishing. **(For Unit - I)**

Sadiq, S., & Zamir, S. (2014). Effectiveness of modular approach in teaching at university level. *Journal of Education and Practice, 5(17)*, 104. **(For Unit - III)**

Seng, L., & Mohamad, F. (2002). Online learning: Is it meant for science courses? . *The internet and higher education, 5(2)*, 109-118. **(For Units - IV & V)**

Sood, J. (2009). *Teaching of science.* New Delhi: Prentice Hall of India.

(For Unit -I, II, III & VI)

Sunal, D. W. (2019). *Physics teaching and learning challenging the paradigm.* USA: Information Age Publishing. **(For Unit - III)**

Teixeira, M. Z. (2020). Correlation between vitalism and genetics according to the paradigm of complexity. *Homeopathy*, *109*(01), 030-036. **(For Unit - I)**

Torres, P. L., & Veiga Marriott, R. D. (2010). *Handbook of research on collaborative Learning using concept mapping.* Hershey, United States: IGI Global. **(For Unit - III)**

Turiman, P., Omar, J., Mohd. Daud, A., & Osman, K. (2012). Fostering the 21st century skills through scientific literacy and science process skills. *Procedia - Social and Behavioral Sciences 59*, 110-116. **(For Unit - III)**

University, H. (1964). *Harvard Project Physics: A new physical science course for schools (Newsletter No. 1)*. Cambridge, MA: Harvard University. **(For Unit - II)**

Watson, M. K., Pelkey, J., Noyes, C., & Rodgers, M. O. (2019). Using Kolbs Learning Cycle to improve student sustainability knowledge. *Sustainability*, *11*(17), 4602. **(For Unit - I)**

Xiao, C., Dunlap, R. E., & Hong, D. (2019). Ecological worldview as the central component of environmental concern: Clarifying the role of the NEP. *Society & natural resources*, *32*(1), 53-72. **(For Unit - I)**

Zhao, X., Wang, J., Wang, M., Li, X., Gao, X., & Huang, C. (2020). A new model for assessing the impact of environmental psychology, e-learning, learning style and school design on the behavior of elementary students. *Kybernetes*. **(For Unit -I)**

Online links:

http://phet.colorado.edu
https://www.library-of-labs.org/
http://virtuallabs.nmsu.edu
http://onlinelabs.in/Physics Labs

Sc. Ed. 557: **Teaching Chemistry**

Course code: Sc. Ed. 557
Level: Three Semester M.Ed.
Semester: Second

Nature of the course: Theoretical
Credit hours: 3
Teaching hours: 48

1. Course Description

The course is designed to develop sound pedagogical knowledge in the chemistry teachers as professionals, a better understanding of classroom practices and competence in various skills required for teaching-learning and evaluating chemistry. This course acquaints with theoretical understanding as well as develops skills through activity-based pedagogical approaches. Meaningful engagement of students with different dimensions of chemistry teaching and learning by using the modern technology-based instruction is the major aim of the course. The course meets the requirements of contemporary chemistry teachers in their place by providing pedagogical techniques and strategies, frameworks, resources and guidelines through the online and distance mode.

There are six units in this course which cover the wider area related approaches to teaching and learning chemistry.

2. General Objectives

The general objectives of the course are as follows:

- To provide chemistry education facilities to the students looking upon chemistry education as a life-long activity,
- To provide effective alternative approaches to learning chemistry wider opportunities in education, especially in higher education,
- To provide chemistry learning opportunities for academic pursuits to the educated professionals willing to improve their knowledge of chemistry education,
- To acquaint the students with chemistry popularization in the modern age,
- To acquaint the students with the structure of secondary and university chemistry curricula,
- To develop competency in the learners to analyze the chemistry curriculum, textbooks, journals and teachers guide,
- To review the curriculum and research articles,
- To provide the students with the in-depth knowledge of modern methods, approaches and techniques as well as models of teaching and learning chemistry.

3. Specific Objectives and Contents

Specific Objectives	Contents
• Describe the nature of chemistry, • Discuss the objectives of teaching chemistry, • Introduce chemistry as an interdisciplinary subject, • Explain the major issues of teaching and learning chemistry in school and university classes, • Discuss the concepts and misconceptions in chemistry, • Explain the role and importance of indigenous knowledge in learning chemistry, • Explore indigenous knowledge of chemistry on the contextual basis, • Plan research and study on the indigenous dimensions of chemistry, • Illustrate the relationship between chemistry and sustainable development, • Define mechanical, vitalist and ecological world view with examples, • Explain the basic steps of the Kolb's experiential learning cycle, • Elaborate on the contribution of Kolb's learning cycle in learning chemistry, • Discuss the contribution of Ausubel's meaningful learning theory in learning chemistry. • Describe Bruner's concept learning in-terms of enactive, iconic and symbolic representation in learning, • Elaborate the contribution of Bruner's concept learning to chemistry learning, • Discuss the importance of multiple intelligence	**Unit I: Nature of Chemistry and Philosophical Grounds (10 hrs.)** **1.12 Nature of Chemistry** 1.1 Objectives of teaching chemistry 1.2 Interdisciplinary dimensions of chemistry 1.3 Issues in teaching and learning chemistry 1.4 Concepts and misconceptions in chemistry 1.5 Indigenous knowledge in learning chemistry 1.6 Chemistry for sustainable development **B. Philosophical Grounds** 1.7 Paradigm shift in chemistry education • Mechanistic world view • Vitalist perspective • Holistic/ecological world view 1.8 Kolb's experiential learning 1.9 Ausubel's theory of meaningful learning 1.10 Bruner's theory of concept learning 1.11 Howard Gardner's multiple intelligences

modalities, • Explore the types of multiple intelligences in chemistry learning.	

Note to the assignment and activities:

Do the following tasks/activities.

i. *Prepare a short paper on the application of chemistry to and present on a seminar.*

ii. *Report on school and the university-based issues of teaching and learning chemistry.*

iii. *Critically review the research papers assigned.*

iv. *Critically review the learning theories in-terms of teaching and learning chemistry. Also, prepare a report on your study.*

v. *Prepare a manuscript for journal articles within the areas of this unit.*

vi. *Carry out a mini-research study on indigenous knowledge in chemistry from your local community and prepare a report on it.*

vii. *Prepare a critical review on study on the misconceptions and alternative conceptions in chemistry from the day-to-day life teaching-learning activities.*

• Discuss the competency-based chemistry curriculum, • Analyze the secondary level and the university level chemistry curricula, • Discuss innovative chemistry projects: Chemical Education Material Study (CHEM-study), Chemical Bond Approach (CBA), Nuffield O-level Chemistry and Salters Advanced Chemistry, • Explain the importance of the innovative chemistry projects, • Elaborate the concept of STEM literacy, • Discuss the needs, features and design of STEM in school curriculum.	**Unit II: Chemistry Curriculum** **(6 hrs.)** 2.6 Introduction 2.7 Competency-based chemistry curriculum 2.8 Analysis of secondary level/university chemistry curricula 2.9 Innovative chemistry projects 2.9.1 Chemical Education Material Study (CHEM-study), United States 2.9.2 Chemical Bond Approach (CBA), United States 2.9.3 Nuffield O-level Chemistry, United Kingdom 2.9.4 U.K. project- Salters Advanced Chemistry 2.5. STEM Literacy 2.5.1. STEM education in the school curriculum

Note on the assignment and activities:

Do the following task and activities.

i. *Report on the issues of different aspects of the curriculum (e.g., the curriculum development process, aspects of curriculum) and organize an online discussion session.*

ii. *Analyze the school chemistry curriculum based on the structure, scope, objectives, organization, strategies and evaluation and prepare a report on it.*

iii. *Develop a summary report on the international initiatives for chemistry curriculum improvement.*

Conduct a webinar on STEM Education in Nepal: Needs, Practices and Prospects.

• Introduce the major paradigm shifts in teaching and learning in chemistry, • Explore the benefits of creativity in chemistry teaching, • Elucidate the ideas of developing creativity among students in learning chemistry, • Discuss the various types of inquiry approaches, • Explain the ways of developing inquiry among students, • Describe the concept of project-based teaching chemistry, • Describe the modular approach to teaching chemistry, • Illustrate the concept map for a chemistry lesson, • Describe the meaning and importance of research-based teaching in higher level chemistry education, • Elucidate the idea of context-based teaching-learning in the chemistry area, • Explain the 21st-century skills in teaching chemistry, • Discuss the importance, challenges and	**Unit III: Approaches in Chemistry Pedagogy (8 hrs.)** 3.11 Paradigm shift in chemistry teaching-learning 3.12 Creativity in chemistry teaching-learning 3.13 Inquiry-based chemistry learning 3.14 Project-based teaching-learning of chemistry 3.15 Context-based teaching chemistry 3.16 Modular approach to teaching chemistry 3.17 Concept map for a chemistry lesson 3.18 Research-based teaching in higher level chemistry education 3.19 21st-century skills in chemistry pedagogy 3.20 Open and distance mode of learning

opportunities of distance and open mode of learning.	

Note on the assignment and activities:

Do the following tasks and activities.

i. *Develop and carry out a mini project in the chemistry education area.*

ii. *Prepare a sample module on the content of chemistry.*

iii. *Apply different student-centered approaches to the preparation of the module in chemistry lessons.*

iv. *Discuss the ideas of developing creativity in students in learning chemistry.*

• Point out the advantages of planning in teaching chemistry, • Design a unit plan for the chemistry course, • Prepare lesson plans in chemistry based on different approaches, • Plan lesson activities using lecture cum demonstration, Herbert approach, ABC approach, 5Es approach, and constructivist approach, • Develop the instructional modules for chemistry lessons, • Apply various aspects of computer-assisted instruction, • Discuss the virtual environment for chemistry teaching-learning, • Use simulation tools for teaching chemistry, • Design game-based teaching materials using the web apps, • Integrate e-learning products to chemistry lesson designing and teaching.	**Unit IV: Planning and e-learning in Chemistry Lessons (8 hrs.)** 4.1 Introduction 4.2 Advantages of planning in teaching chemistry 4.3 Unit planning 4.4 Lesson planning 4.5 Various models for designing science lesson activities: Herbart, ABC, 5Es and Constructivist 4.6 Instructional module in chemistry 4.7 Computer-assisted Instruction 4.8 Virtual environment for chemistry teaching 4.9 Simulation in chemistry teaching 4.10 Teaching chemistry gaming mode 4.11 e-learning products: LMSs, web-based educational materials and video conferencing

Note on the assignment and activities:

Do the following tasks and activities.

i. *Design the instructional module in chemistry topics* ii. *Develop teaching materials using the simulation mode, and the gaming mode.* iii. *Critically analyze the importance of virtual learning environments such as VLEs,* iv. *Design LMSs for teaching and learning chemistry.* v. *Apply videoconferencing to chemistry learning.* vi. *Search the web-based materials for teaching and learning chemistry.* vii. *Design a chemistry game using the computer gaming mode/apps*	
• Indicate the basic characteristics of the good chemistry laboratory, • Develop the designs of the various models of the chemistry laboratory, • Describe laboratory management and its techniques, • Perform chemistry laboratory skills, • Discuss chemistry laboratory safety • Identify the major chemistry laboratory, accidents and suggest their first aid treatment, • Use the virtual chemistry laboratory for the teaching-learning of chemistry, • Illustrate the importance of a mobile chemistry laboratory, • Design teaching aids using locally available materials, • Improvise chemistry teaching aids using locally available materials, • Discuss the various kinds of laboratory-based materials.	**Unit V: Chemistry Laboratory and Improvisation of Materials (8 hrs.)** 5.1 Introduction 5.2 Characteristics of a good chemistry laboratory 5.3 Planning and designing the chemistry laboratory 5.4 Laboratory management and its techniques 5.5 Chemistry laboratory skills 5.6 Chemistry laboratory safety, accidents and first aids 5.7 Virtual chemistry laboratory 5.8 Chemistry mobile laboratory 5.9 Improvisation of chemistry teaching aids
Note on the assignment and activities: Do the following tasks and activities. i. *Conduct a virtual meeting to share different aspects of the chemistry laboratory (e.g., characteristics, design, and laboratory management).* ii. *Design the various models of the chemistry laboratory.* iii. *Conduct different chemistry activities using the virtual lab*	

iv. *Carry out a survey on students' awareness of laboratory-based activities, lab safety, accidents and first aid treatment.* v. *Design various improvised materials using locally available materials*	
• Explore the relationship between objectives, learning experiences and evaluation, • Explain the basic characteristics of good chemistry test items, • Differentiate between the norm-referenced test (NRT) and criterion- referenced tests (CRT), • Describe the importance of chemistry theory test items and its type, • Develop different models of chemistry practical test items for secondary level and higher-level chemistry courses, • Prepare the specification grid based on the chemistry courses, • Construct standardized chemistry test items, Elaborate on the process of test standardization, • Explain the criteria of item analysis and use them for the standardization of test items, • Calculate the item difficulty and discrimination index of chemistry test items, • Use the online testing system, • Develop students' portfolio/ E-portfolio, • Explain the letter grading system, • Develop rubrics for chemistry evaluation in chemistry.	**Unit VI: Evaluation (8 hrs.)** 6.1 Introduction 6.2 Objectives, learning experiences and evaluation 6.3 Characteristics of good chemistry test items 6.4 Norm-referenced test (NRT) and Criterion-referenced tests (CRT) 6.5 Chemistry theory and practical test items 6.6 Specification grid 6.7 Construction of test items based on revised Bloom's taxonomy 6.8 Test standardization 6.7 Item analysis: Item difficulty, discrimination index and reliability measurement 6.8 Computer-based testing 6.9 Portfolio and e-portfolio development 6.10 The letter grading system 6.11 Rubrics
Note on the assignment and activities: Do the following tasks and activities. i. *Develop a model specification chart for chemistry*	

ii.	*Design a chemistry theory test item from the chemistry lesson for the different levels of the cognitive domain, then administer and calculate the item difficulty and discrimination index.*
iii.	*Design online testing tools*
iv.	*Design a rubric for the evaluation of knowledge and skills in chemistry*
v.	*Design the E-portfolio of students*

4 Instructional Strategies

The instructional strategies will be of the blended type including the face to face contact sessions and online and distance mode interactions. The students will get ample opportunities for self-study self by the use of SLM, books, articles and e-resources provided by the course facilitator. They will be provided with the learning materials through different e-platforms and as handouts during the contact sessions. There will be regular interactions among the peers and with the facilitator through the virtual meetings/conferences. The students will have to read articles, review them, select specific areas and prepare journal articles manuscripts for publication

4.1. General Techniques

- Online lecture and question-answer
- Participatory activities
- Inquiry: Generating questions and answers through dialogues
- Internet search

4.2. Specific Instructional Techniques

1 Document study, Debate, and manuscript writing (Unit 1)

2 Curriculum Review (Unit 2)

3 Workshop cum discussion (Unit 3)

4 Virtual conference (Unit 4)

5 Collaborative work (Unit 5)

6 Workshop, survey and report writing (Unit 6)

Note: *The mode of delivering the course is online. A short presentation will be given before or after the activities by the facilitator during the contact sessions about the overall course plan, time schedule, modes of lesson delivery, assessment systems, and so on.*

5. Evaluation

Nature of course	Internal Assessment	Semester Examination	Total Marks
Theory	40 marks	60 marks	100 marks

Note: The students will have to pass separately in the internal assessment and the semester examination.

5.1 Internal Evaluation (40 marks)

The internal evaluation will be conducted by the course facilitator based on the following activities:

1.	Attendance (Contact session and discussion forums)	5 marks
2.	Students learning engagement	5 marks
3.	Assignment I	10 marks
4.	Assignment II	10 marks
5.	Assignment III (Project work/review books/journal articles/dissertations)	10 marks
	Total	**40 marks**

5.2 External Evaluation (Final Examination) (60 marks)

Examination Division, the Office of the Dean, Faculty of Education will conduct the final examination at the end of the semester. The marks distribution will be as follows

1.	Objective type questions (Multiple choice question 10 ×1mark)	10 marks
2.	Short answer questions (6 questions with 2 'OR' questions × 5 marks)	30 marks
3.	Long answer questions (2 questions with 1 'OR' question × 10 marks)	20 marks
	Total	**60 marks**

Note: The marking system will be changed to the CGPA system as per the rule and regulation of the Academic Council, Tribhuvan University.

Recommended Books and References

Acharya, K. P. (2020). *Teaching of Science: A Contemporary Approach.* Intellectuals' Book Palace, Kathmandu. **(For all Units)**

Amos, S., &Boohan, R. (2002). *Aspects of teaching secondary science: Perspective on practice.* New York & London: Routledge Taylor and Francis Group. **(For Unit I)**

Banks, F., & Barlex, D. (2014). Teaching STEM in the Secondary School: Helping teachers meet the challenge. New York. Routledge. **(For Unit II)**

Chambers, D. W. (1993). Toward a competency-based curriculum. *Journal of Dental Education, 57*, 790-790. **(For Unit II)**

Davar, M. (2012). *Teaching of Science.* New Delhi: PHI Learning Private Limited. **(For Units I, IV, V, VI)**

Duran, L. B., & Duran, E. (2004). The 5E Instructional Model: A Learning Cycle Approach for Inquiry-Based Science Teaching. *Science Education Review*, *3*(2), 49-58. (for **Unit IV)**

Gupta,V. K.(2005). *Teaching and learning of science and technology*, New Delhi: Vikas Publishing House **(For Unit IV)**

Guskey, T. R. (2011). Five obstacles to grading reform. *Educational Leadership*, *69*(3), 16. **(For Unit VI)**

Hofstein, A., &Lunetta, V. N. (1982). The role of the laboratory in science teaching: Neglected aspects of research. *Review of educational research*, *52*(2), 201-217. **(For Unit V)**

Howarth, S. & Scott, L. (2014). *Success with STEM: Ideas for the classroom, STEM clubs and beyond.* Oxon: Routledge. **(For Unit II)**

Lau, D. C. M. (2001). Analyzing the curriculum development process: three models. *Pedagogy, culture and society*, *9*(1), 29-44. **(For Unit II)**

Levine, M., Serio, N., Radaram, B., Chaudhuri, S., & Talbert, W. (2015). Addressing the STEM gender gap by designing and implementing an educational outreach chemistry camp for middle school girls. *Journal of Chemical Education*, *92*(10), 1639-1644. **(For Unit I)**

Mohan, R. (2007). *Innovative science teaching.* New Delhi: Prentice-Hall of India Pvt. Ltd. **(For All Units)**

Bjønness, B., &Kolstø, S. D. (2015). Scaffolding open inquiry: How a teacher provides students with structure and space. **(For Unit III)**

Ornstein, A. C. (1993). Norm-referenced and criterion-referenced tests: An overview. *NASSP Bulletin*, *77*(555), 28-39. **(For Unit VI)**

Sadiq, S., &Zamir, S. (2014). Effectiveness of modular approach in teaching at university level. *Journal of Education and Practice*, *5*(17), 104. **(For Unit III)**

Seng, L., &Mohamad, F. S. (2002). Online learning: Is it meant for science courses? *The internet and higher education*, *5*(2), 109-118. **(For Unit IV, V)**

Sood, J. K. (2009). *Teaching of science.* New Delhi: Prentice Hall of India **(For Units I, II, III, IV and VI)**

Sc. Ed. 558: **Teaching Biology**

Course Code: Sc. Ed. 558 | Nature of the course: Theoretical

Level: Three Semester M.Ed. | Credit hours: 3

Semester: Second | Teaching hours: 48

1. Course Description

The course is designed to develop professional Biology teachers with sound pedagogical knowledge, better understanding of classroom practices and competence in various skills required for teaching learning and evaluation Biology. This course acquaints the students in theoretical understanding of the conceptual as well as developing skills through activity- based pedagogical approaches. The scope of the course basically includes the meaningful engagement of the students with different dimensions of Biology teaching and learning by using the modern technology-based instruction. It meets the requirements of contemporary Biology teachers in their own places by providing pedagogical techniques and strategies, frameworks, resources and guidelines through the online and distance mode.

This course is divided into six units which covers the wider area of contents relating to the approaches to teaching and learning Biology.

2. General Objectives

The general objectives of the course are as follows.

- To provide education facilities to those Biology teaching professionals so as to equip them with biology education as a life-logically who look upon Biology education as a life-long activity;
- To acquaint the students with effective alternative Biology learning approaches to wider opportunities in education especially in higher education;
- To provide the students with Biology learning opportunities for their academic pursuit through Biology education;
- To develop competency needed for analyzing the Biology curriculum, text books, journals and teachers guide;
- To provide the students with in-depth knowledge of modern methods, approaches and techniques as well as models related to Biology teaching and learning;
- To make the students familiar with teaching Biology using information technology.
- To acquaint students with different systems of evaluation and use them for the evaluation of Biology

3. Specific Objectives and Contents

Specific Objectives	Contents
• Describe the nature of Biology • Discuss the objectives of teaching Biology • Discuss the Biology as an interdisciplinary subject • Explain the major issues of Biology teaching and learning Biology in school and the university classes • Discuss the concepts and misconceptions in Biology • Elaborate the role and importance of indigenous knowledge in Biology learning • Explore indigenous knowledge of Biology on the contextual basis • Plan research and studies on the indigenous dimensions of Biology • Illustrate Biology and sustainable development as interrelated genres • Define mechanical, vitalist and ecological world views with examples • Explain the basic steps of Kolb's experiential learning cycles • Elaborate the contribution of Kolb's learning cycle to learning Biology • Discuss the contribution of Ausubel's meaningful learning theory to learning Biology • Describe Bruner's concept learning in-terms of enactive, iconic and symbolic representation in learning • Elaborate the contribution of Bruner's concept learning to learning Biology • Discuss the importance of the multiple intelligence modalities	**Unit I: Nature of Biology and Philosophical Grounds (10 hrs.)** **1.13 A. Nature of Biology** 1.12 Objectives of teaching Biology 1.13 Scope of Biology 1.14 Importance of Biology 1.15 Issues of teaching and learning Biology 1.16 Misconceptions in Biology 1.17 Indigenous knowledge in learning Biology 1.18 Biology for sustainable development **B. Philosophical Grounds** **1.19 Paradigm shift** • Mechanistic world view • Vitalist perspective • Holistic/ecological world view 1.20 Kolb's experiential learning 1.21 Ausubel's theory of meaningful learning 1.22 Bruner's theory of concept learning 1.23 Howard Gardner's multiple intelligences

• Explore the types of multiple intelligences to learning Biology.	

Note on the assignment and activities:

Do the following tasks/ activities.

- *Prepare a discussion paper on the application of Biology for daily life.*
- *Prepare report on school and the university-based issues of Biology teaching and learning.*
- *Critically review the assigned research papers.*
- *Critically review the given learning theories in-terms of teaching and learning Biology. Also prepare a report based on your study.*
- *Prepare the manuscript for journal articles within the areas of this unit.*
- *Carry out a mini research study on indigenous knowledge in Biology from your local community. Then prepare a report.*
- *Study the misconceptions and alternative conceptions in Biology from the day-to-day life teaching learning activities. Then prepare a paper for discussions.*

• Discuss the meaning of the competency-based Biology curriculum • Analyze the Biology curriculum of the secondary and the university levels • Introduce the innovative Biology projects: - BSCS - Nuffield O-level Biology • Explain the importance of the innovative Biology projects. • Elaborate the concept of STEM literacy • Discuss the need, feature and design of STEM in school curriculum	**Unit II: Biology Curriculum (6 hrs.)** 2.10 Introduction 2.11 The Competency-based Biology curriculum 2.12 Analysis of secondary/university level curriculum of Biology 2.13 The Innovative Biology projects 2.13.1 Biology Education Material Study (BSCS -study), United States 2.13.2 Nuffield O-level Biology, United Kingdom 2.14 . STEM Literacy 2.15 STEM in school curriculum

Note on the assignment and activities:

Do the following tasks/ activities.

- *Report on the issues of different aspects of curriculum (e.g., curriculum development process, aspects of curriculum) and organize an online discussion session.*
- *Analyze the secondary level Biology curriculum based on the structure, scope, objectives, organization, strategies and evaluation and then prepare a report on it.*

• *Develop a summary report on international initiatives for the improvement of the Biology curriculum.* • *Conduct a webinar on STEM education in Nepal: Need, practices and prospects.*	
• Describe the major paradigm shifts in Biology teaching and learning • Explore the benefits of creativity in teaching Biology • Elucidate the ideas of developing creativity in students learning Biology • Discuss various types of inquiry approaches • Explain the ways of developing inquiry in students • Describe the project-based teaching of Biology • Describe the modular approach to teaching Biology • Illustrate the concept map for a Biology lesson • Describe the meaning and importance of research-based teaching in higher level Biology education • Elucidate the idea of context-based teaching learning in an area of Biology • Explain the 21st century skills in teaching Biology • Discuss the importance, challenges and opportunities of the distance and open mode of learning	**Unit III: Approaches to Biology Pedagogy (8 hrs.)** 3.21 Paradigm shift in teaching and learning of Biology 3.22 Creativity in teaching and learning of Biology 3.23 Inquiry-based Biology learning 3.24 Project-based teaching -learning 3.25 Context-based teaching of Biology 3.26 Modular approach on teaching Biology 3.27 Concept map for a Biology lesson 3.28 Research-based teaching in higher level Biology education 3.29 21st century skills of pedagogy in Biology 3.30 Open and distance mode of learning
Note on the assignment and activities: Do the following tasks/ activities. • *Develop and carry out a mini project in Biology education area.* • *Prepare a sample module on a content of Biology.* • *Apply different student-centered approaches to the preparation of the module in*	

Biology lessons. • *Discuss the ideas of developing creativity in students in learning Biology.*	
• Describe the advantages of planning in teaching Biology • Design a unit plan for Biology • Prepare lesson plans on topics related to different approaches to teaching Biology • Plan lesson activities using lecture cum demonstration, Herbert approach, ABC approach, 5Es approach, and constructivist approach • Develop the instructional modules for Biology lessons • Apply the various aspects of computer assisted instruction • Discuss the concept of virtual environment for Biology teaching learning • Use simulation tools in teaching Biology • Design game-based teaching materials using web apps • Integrate e-learning products to lesson designing and teaching Biology	**Unit IV: Planning and e-learning in Biology Lessons (8 hrs.)** 4.12 Introduction 4.13 Advantages of planning in teaching Biology 4.14 Unit planning 4.15 Lesson planning 4.16 Various models for designing science lesson activities: Herbart, ABC, 5Es and constructivist 4.17 Instructional module in Biology 4.18 Computer Assisted Instruction 4.19 Virtual environment for teaching Biology 4.20 Simulation in teaching Biology 4.21 Teaching Biology in the gaming mode 4.22 e-learning products: LMSs, web based educational materials, video conferencing
Note on the assignment and activities: Do the following tasks/ activities. • *Design an instructional module on topics related to Biology.* • *Develop teaching materials using the simulation mode, and the gaming mode.* • *Critically analyze the importance of virtual learning environments such as VLEs.* • *Design LMSs for teaching and learning Biology.* • *Apply videoconferencing to learning Biology.* • *Search web-based materials for teaching and learning Biology.* • *Design a Biology game using the computer gaming mode/apps.*	
• Explain the basic characteristics of a good Biology laboratory	**Unit V: Biology Laboratory and Improvisation of Materials (8 hrs.)**

• Develop the designs of various models of the Biology laboratory • Bring out the concept of laboratory management and describe its techniques • Develop the laboratory skills in Biology • Discuss the Biology laboratory safety • Identify the major Biology laboratory accidents and suggest their first aid treatment • Use the virtual Biology laboratory for teaching and learning of Biology • Illustrate the importance of the mobile Biology laboratory • Design teaching aids using locally available materials • Improvise teaching aids for teaching Biology using locally available materials • Discuss the various kinds of laboratory-based materials	5.10 Introduction 5.11 Characteristics of a good Biology laboratory 5.12 Planning and designing the Biology laboratory 5.13 Laboratory management and its technique 5.14 Biology laboratory skills 5.15 Biology laboratory safety, accidents and first aids 5.16 Virtual Biology laboratory 5.17 Mobile Biology laboratory 5.18 Improvisation of teaching aids for Biology
Note on the assignment and activities: Do the following tasks/ activities. • *Conduct a virtual meeting to share the different aspects of Biology laboratory (e.g., characteristics, design, and laboratory management).* • *Design various models of Biology laboratory.* • *Conduct different Biology related activities using the Virtual Lab.* • *Conduct a survey on student's awareness of laboratory-based activities, lab safety, accidents and first aid treatment.* • *Design improvised materials of the various kinds using locally available materials.*	
• Explore the relationships between objectives, learning experiences and evaluation • Explain the basis characteristics of good Biology test items • Differentiate between the norm referenced	**Unit VI: Evaluation (8 hrs.)** 6.1 Introduction 6.2 Objectives, learning experiences and evaluation 6.3 Characteristics of good Biology test items

test (NRT) and criterion referenced test (CRT) . • Describe the importance of Biology theory test items and their types • Develop different models of Biology practical test items for secondary and higher-level Biology courses • Prepare the specification grid based on the Biology courses • Construct standardized Biology test items • Elaborate the process of test standardization • State the criteria of item analysis and use them for standardization of test items • Calculate item difficulty and discrimination index of Biology test items • Use online testing system • Develop students' portfolio/ E-portfolio • Introduce the letter grading system • Develop rubrics for evaluation in Biology	6.4 Norm referenced test (NRT) and Criterion referenced test (CRT) 6.5 Biology theory and practical test items 6.6 Specification grid 6.7 Construction of test items based on the revised Bloom's taxonomy 6.8 Test standardization 6.7 Item analysis: Item difficulty, discrimination index and reliability measurement 6.8 Computer-based testing 6.9 Portfolio and e-portfolio development 6.10 Letter grading system 6.11 Rubrics
Note on the assignment and activities: Do the following tasks/ activities. • *Develop a model specification chart for testing Biology* • *Design a theory test item in Biology from a lesson in Biology for different levels of cognitive domain. Then administer and calculate the item difficulty and discrimination index.* • *Design online testing tools applicable to Biology.* • *Design a rubric for evaluating the knowledge and skills in Biology.* • *Design E-portfolio of students applicable to Biology.*	

4 Instructional Strategies

The instructional strategies will be of blended type including the face to face contact sessions and online and distance mode interactions. The students will get ample opportunities for self-study using the use of SLM, books, articles and e-resources provided by the course facilitator. They will be provided with the learning materials through different

e-platforms and handouts during the contact sessions. There will be regular interactions among the peers and with the facilitator through virtual meetings/conferences. The students will have to read articles, review them, select specific areas and prepare journal article manuscripts for publication

4.1 General Techniques

- Online lecture and question-answer
- Participatory activities
- Inquiry: Generating questions and answers through dialogues
- Internet search

4.2. Specific Instructional Techniques

Units	**Specific Instructional Technique**	Remarks
1	Document study, Debate, and manuscript writing	
2	Curriculum Review	
3	Workshop cum discussion	
4	Virtual conference	
5	Collaborative work	
6	Workshop, survey and report writing	

Note: The mode of delivering the course is online. A short presentation will be given before or after the activities by the facilitator during the contact sessions about the overall course plan, time schedule, modes of lesson delivery, assessment systems, and so on.

5. Evaluation

Nature of the course	**Internal Assessment**	**Semester Examination**	**Total marks**
Theory	40 marks	60 marks	100 marks

***Note**: The Students must pass separately in the internal assessment and the semester examination.*

5.1. Internal Evaluation (40 marks)

The internal evaluation will be conducted by the course facilitator based on following activities:

1.	Attendance	5 marks
2.	Students learning engagement	5 marks
3.	Assignment I	10 marks
4.	Assignment II	10 marks
5.	Assignment III	10 marks
	Total	**40 marks**

Note: The facilitator can decide on the assignments according to the nature of the subject, which might be project work and presentation, webinar, review of books or articles or dissertation or documents, case study, designing modules / lessons, survey/field study and individual/group report writing and presentation, term paper etc.

5.2. External Evaluation (Final Examination) (60 marks)

The Examination Division, Office of the Dean, Faculty of Education will conduct the final examination at the end of the semester. The mark distribution will be as follows

1.	Objective type question (Multiple choice question 10 × 1mark)	10 marks
2.	Short answer questions (6 questions with 2 or questions × 5 marks)	30 marks
3.	Long answer questions (2 questions with 1 or questions × 10 marks)	20 marks
	Total	**60 marks**

Note: The marking system will be changed in to the CGPA system as per the rule and regulation of the Academic Council, Tribhuvan University.

Recommended Books and References

Ahmad.J., (2011). *Teaching of Biological Science (2nd edition)*. New Delhi: PHI Learning Private Limited.

Amos, S., &Boohan, R. (2002). *Aspects of teaching secondary science: Perspective on practice.* New York & London: Routledge Taylor and Francis Group. **(For Unit I)**

Banks, F., & Barlex, D. (2014). Teaching STEM in the secondary school: Helping teachers meet the challenge. New York. Routledge. **(For Unit II)**

Chambers, D. W. (1993). Toward a competency-based curriculum. *Journal of Dental Education, 57*, 790-790. **(For Unit II)**

Davar, M. (2012). *Teaching of Science.* New Delhi: PHI Learning Private Limited. **(For Units I, IV, V, VI)**

Duran, L. B., & Duran, E. (2004). The 5E instructional model: A learning cycle approach for inquiry-based science teaching. *Science Education Review*, *3*(2), 49-58. **(For Unit IV)**

Gupta,V.K. (2005).*Teaching and learning of science and technology*, New Delhi: Vikas Publishing House **(For Unit IV)**

Guskey, T. R. (2011). Five obstacles to grading reform. *Educational Leadership*, *69*(3), 16. **(For Unit VI)**

Hofstein, A., &Lunetta, V. N. (1982). The role of the laboratory in science teaching: Neglected aspects of research. *Review of educational research*, *52*(2), 201-217. **(For Unit V)**

Howarth, S. & Scott, L. (2014). Success with STEM: Ideas for the classroom, STEM clubs and beyond. Oxon: Routledge. **(For Unit II)**

Lau, D. C. M. (2001). Analyzing the curriculum development process: three models. *Pedagogy, culture and society*, *9*(1), 29-44. **(For Unit II)**

Mohan, R. (2007). *Innovative science teaching*. New Delhi: Prentice-Hall of India Pvt. Ltd. **(For All Units)**

ønness, B., &Kolstø, S. D. (2015). Scaffolding open inquiry: How a teacher provides students with structure and space. **(For Unit III)**

Ornstein, A. C. (1993). Norm-referenced and criterion-referenced tests: An overview. *NASSP Bulletin*, *77*(555), 28-39. **(For Unit VI)**

Sadiq, S., &Zamir, S. (2014). Effectiveness of modular approach in teaching at university level. *Journal of Education and Practice*, *5*(17), 104. **(For Unit III)**

Seng, L., &Mohamad, F. S. (2002). Online learning: Is it meant for science courses? *The internet and higher education*, *5*(2), 109-118. **(For Unit IV, V)**

Sood, J. K. (2009). *Teaching of science.* New Delhi: Prentice Hall of India **(For Units I, II, III, IV and VI)**

Online Materials:

- https://education.seattlepi.com/top-10-misconceptions-biology-7072.html) **(For Unit I)**
- https://www.researchgate.net/publication/232666002_Indigenous_Knowledge_in_the_Life_Sciences_Classroom_Put_on_Your_de_Bono_Hats) (file:///C:/Users/Dell/Downloads/ABTIKDeBonoarticleDeBeerWhitlock.pdf)
- Donnavan, J. D., KrugerDonnavan, J. D., de Beer, K. J. & de Beer, J. (2019). Infusing indigenous knowledge in the life sciences classroom: design principles for creating an ethno biological matrix. Conference: 8th Teaching & Education Conference, Vienna. DOI: 10.20472/TEC.2019.008.014

Sc. Ed. 559: **Teaching Environment**

Course Code: Sc. Ed. 559 | Nature of the course: Theoretical

Level: Three Semester M.Ed. | Credit hours: 3

Semester: Second | Teaching hours: 48

1. Course Description

The course is designed with the aim to develop professional environment teachers with sound pedagogical knowledge, better understanding of classroom practices and competent in various skills required for interdisciplinary aspects of environment teaching, learning and evaluation. The course will also make the students able to select the appropriate ways of environment quality assessment and natural resources management. This course acquaints the students with theoretical understanding as well as develops in them skills through activity- based pedagogical approaches. The meaningful engagement of students with different dimensions of environment teaching and learning by using the modern technology-based instructions is the major scope of the course. Basically, under this course teaching-learning activities centralize on the students' self-construction of knowledge through active participation in their own pace. It meets the requirements of contemporary environment teachers in their own place by providing pedagogical techniques and strategies, frameworks, resources and guidelines through the online and distance mode.

There are six units in this course which cover the wider area of content relating to environment teaching and learning approaches. The activities (projects) are also designed on the basis of theoretical units, which will help to translate the theoretical knowledge of the students in the real-life situation with self-practice. In addition, research-based scientific attitude, learning experience and motivation, utilization of various teaching methods, technique, instructional aids, laboratory handling and evaluation of academic performance of the students as well as the co-curricular activities are the major focuses under this curriculum. After the completion of this course, the students will be aspiring educators, and as expected they will directly contribute to the improvement of the quality of human and ecological health, and maintain the environmental sustainability.

2. General Objectives

The general objectives of the course are as follows.

- To provide the general background of environment education to those individuals who look upon environment education as a life-long activity;
- To give them insights into the philosophy, values and scope of environmental education;

- To acquaint them with the environmental science curriculum and related pedagogical aspects;
- To acquaint them about the structure of secondary and university environment curriculum;
- To acquaint them with the shifting paradigm in teaching environment;
- To provide the students with in-depth knowledge of modern methods, approaches and techniques as well as models for environment teaching and learning;
- To provide them with in-depth knowledge of the planning aspects of teaching environment;
- To develop competency in analyzing the various models for designing science lessons and the teacher guide;
- To develop skills for handling the laboratory, field and project activities with necessary safety measures
- To improvise environment teaching aids using locally available materials;
- To acquaint the students with monitoring and evaluation processes, techniques, approaches and models of teaching environmental science

3. Specific Objectives and Contents

Specific Objectives	Contents
• Describe the general concept, objective, and scope of environment and environmental education • Discuss the historical development of environmental education, and guiding principles • Discuss the environment as an interdisciplinary subject • Enlighten the concept of the evolution of society and culture in the environment • Discuss concepts of indigenous knowledge and its role in environmental learning • Plan research and study on the indigenous dimensions of the environment • Illustrate that the environment and	**Unit I: The Nature of the Environment and** **A. Philosophical Grounds (10 hrs.)** **1.14 The Nature of the Environment** 1.2 Concept, objectives and scope of environmental education 1.3 Historical development, and guiding principles of environmental education 1.4 Interdisciplinary dimensions of the environment 1.5 Evolution of society and culture in the environment 1.6 Indigenous knowledge in environment learning 1.7 Environment for sustainable development 1.8 Environmental education in Nepal 1.9 Issues in environment teaching and learning **C. Philosophical Grounds**

sustainable development are interrelated • Highlight the status of environmental education in Nepal • Explore the issues of environment teaching and learning in the school and the university classes • Define mechanical, vitalism and ecological world views with examples • Describe the basic steps of Kolb's experiential learning cycle	1.10 Paradigm shift in environment education • Mechanistic world view • Vitalist perspective • Holistic/ecological world view 1.11 Kolb's experiential learning 1.12 Ausubel's theory of meaningful learning 1.13 Bruner's theory of concept learning 1.14 Howard Gardner's multiple intelligence
• Elaborate the contribution of Kolb's learning cycle to environment learning • Discuss the contribution of Ausubel's meaningful learning theory in environment learning • Describe Bruner's concept learning in-terms of enactive, iconic and symbolic representation in learning • Elaborate the contribution of Bruner's theory of concept learning in environment learning • Discuss the importance of multiple intelligence modalities • Explore the types of multiple intelligences in environment learning	

Note on the assignment and activities:

Do the following tasks/ activities.

- *Report on the application of the environment in daily life.*
- *Report on school and the university-based issues of environment teaching and learning.*
- *Critically review the assigned research papers on environmental education.*
- *Critically review the given learning theories given in-terms of environment teaching and learning. Also, prepare a report based on this study.*
- *Carry a case - based mini research study on indigenous knowledge in environment from your local community and prepare a report based on your skills.*

• *Prepare the manuscript for journal articles within the areas of sustainability in the environment.* • *Prepare a report on stewardship for environmental sustainability in society*	
• Discuss the concept of framing the environmental curriculum • Describe the main components of and the approaches to the environmental education curriculum • Discuss the competency-based environment curriculum • Design the environmental science curricula of the essence of school/university level • Analyze the curriculum of secondary school and the university environment curricula • Discuss the innovative environmental projects • Explain the importance of innovative environment projects in school/university environment curricula • Elaborate the concept of STEM literacy • Discuss the needs, features and design of STEM in School Curriculum	**Unit II: Environment Curriculum (6 hrs.)** 2.16 Introduction and concept of framing the environmental curriculum 2.17 Components of and approaches to developing the environmental curriculum 2.18 Competency-based environment curriculum 2.19 Designing environmental science curriculum 2.20 Analysis of the secondary school/university environment curricula 2.21 Innovative environment projects/field work in the school/university environment curriculum 2.22 STEM Literacy 2.22.1 STEM in the school curriculum
Note on the assignment and activities: Do the following tasks/ activities. • *Review the existing environmental science school curricula, and critically evaluate their scope, relevancy, strength and weakness* • *Report on the issues of different aspects of curriculum (e.g., curriculum development process, aspects of curriculum) and organize an online of the discussion sessions* • *Prepare the report after analyzing the secondary school environment curriculum in terms of its on structure, scope, objectives, organization, strategies and evaluation*	

- *Compare and contrast the university level environmental science curricula with national and international curricula*
- *Develop a summary report on the international initiatives for environment curriculum improvement*
- *Conduct a webinar on STEM Education in Nepal: Needs, Practices and Prospects*

• Describe the major paradigm shifts in environment teaching and learning • Explore the benefits of critical thinking in environment teaching. • Elucidate the ideas of developing creativity among students in learning environment education • Discuss various types of inquiry approaches • Describe the ways of developing inquiry among students • Explain the project-based teaching environment • Describe the context-based teaching environment • Describe the modular approach to teaching environment education • Illustrate the concept map for the environment lesson • Highlight the applicability of field work and laboratory methods in teaching environment education • Elucidate the role of term paper, case study, and literature review in teaching learning in the environment area • Discuss the importance, challenges and opportunities of distance and open mode of learning	**Unit III: Approaches in Environmental Pedagogy (8 hrs.)** 3.31 Paradigm shift in teaching and learning environment education 3.32 Critical thinking and creativity 3.33 Inquiry-based environment learning 3.34 Project-based teaching learning 3.35 Context-based teaching of environment education 3.36 Modular approach to teaching environment education 3.37 Concept map for the environment lesson 3.38 Field/laboratory methods for environment learning 3.39 Term paper, case study and literature review for environment learning 3.40 Open and distance modes of learning environment education 3.41 Research-based teaching in higher level environment education 3.42 21st century skills in environment pedagogy

• Describe the role of research-based teaching in higher level environment education • Explain the 21st century skills in teaching environment.	

Note on the assignment and activities:

Do the following tasks/ activities.

- *Review and write a term paper on paradigm shift in teaching environment education,*
- *Perform the tasks assigned related to field work and laboratory analysis,*
- *Prepare a sample module on the content of environment education,*
- *Apply different student-centered approaches to the preparation of the module in environment lessons*
- *Discuss the ideas of developing creativity among students in learning environment education and prepare a case study*
- *Prepare the manuscript of an article review focusing on one of the contemporary environmental issues*

• Introduce the concept of planning in teaching environment education • Describe the advantages of planning in environment teaching • Design the unit plan for an environment course • Prepare lesson plan on environment topic based on different approaches • Plan lesson activities using Lecture cum demonstration, Herbert approach, ABC approach, 5Es approach, and constructivist approach • Develop the instructional modules for environment lessons • Apply various aspects of computer assisted instruction to teaching environment education	**Unit IV: Planning and e-learning in Teaching Environment (8 hrs.)** 4.23 Introduction to planning in teaching environment education 4.24 Advantages of planning in teaching environment education 4.25 Unit planning and lesson planning 4.26 Various models for designing environment education related lesson activities: Herbart, ABC, 5Es and the Constructivist approach 4.27 Instructional module in environment 4.28 Computer Assisted Instruction 4.29 Virtual environment for environment teaching environment education 4.30 Simulation in teaching environment education 4.31 Teaching environment through the gaming mode

• Discuss the use of the virtual environment for environment teaching learning • Use simulation tools in teaching environment • Design game-based teaching materials using web apps • Integrate e-learning products in environment lesson designing and teaching • Discuss the role of videoconferencing in teaching environment education	4.32 e-learning products: LMSs, web based educational materials, video conferencing
Note on the assignment and activities: Do the following tasks/ activities. • *Develop annual and unit plans for teaching environment in at school level using the child centered approaches* • *Design instructional module on topics related to environment education* • *Develop teaching materials using the simulation mode, and gaming mode.* • *Critically analyze the importance of virtual learning environments such as VLEs, LMS.* • *Design LMSs for teaching and learning environment education.* • *Apply videoconferencing to environment learning* • *Search the web-based materials for environment teaching and learning* • *Design environment games using the computer gaming mode/apps*	
• Explain the basic characteristics of a good environment laboratory • Develop the designs of various models of the environment laboratory • Describe the laboratory management and its techniques • Develop the environment laboratory skills • Discuss the concept of environment laboratory safety • Identify the major environment	**Unit V: Environment Laboratory and Instructional Aids (8 hrs.)** 5.19 Introduction and importance of environmental laboratory 5.20 Characteristics of a good environment laboratory 5.21 Planning and designing the environment laboratory 5.22 Laboratory management and its technique 5.23 Environment laboratory skills

laboratory accidents and suggest their first aid treatment • Use the virtual environment laboratory for teaching and learning environment education • Illustrate the importance of mobile environment laboratory • Design teaching aids using locally available materials • Improvise environment teaching aids using locally available materials • Discuss the various kinds of laboratory-based materials	5.24 Environment laboratory safety, accidents and first aids 5.25 Virtual environment laboratory 5.26 Environment mobile laboratory 5.27 Instructional aids in teaching environment education 5.28 Locally available materials for teaching environment education

Note on the assignment and activities:

Do the following tasks/ activities.

- *Conduct a virtual meeting to share different aspects of the environment laboratory (e.g., characteristics, design, and laboratory management)*
- *Design various models of the environment laboratory*
- *Conduct different environment activities using the virtual lab*
- *Highlight the major health hazards associated with the laboratory and write a report on the safety measures*
- *Conduct a survey on student's awareness about laboratory-based activities, accidents and first aid treatment*
- *Design various improvised materials using the locally available materials*

• Explore the relationships between objectives, learning experiences and evaluation • Explain the basis characteristics of good environment test items • Differentiate between the norm-referenced test (NRT) and criterion-referenced tests (CRT) • Describe the importance of environment theory for test items and	**Unit VI: Evaluation (8 hrs.)** 6.1 Introduction, types and practices 6.2 Objectives, learning experiences and evaluation 6.3 Characteristics of good environment test items 6.4 Norm referenced test (NRT) and Criterion referenced tests (CRT) 6.5 Environment theory and practical test items 6.6 The specification grid

their types • Develop different models of environment based practical test items for high school and higher-level environment courses • Prepare the specification grid based on the environment courses. • Construct standardized environment test items. • Elaborate the process of test standardization • Explain the criteria of item analysis and use them for standardization of test items • Calculate item difficulty and the discrimination index of environment test items. • Use the online testing system • Develop the students' portfolio/ E-portfolio • Explain the letter grading system • Develop rubrics for evaluation applicable to environment evaluation	6.7 Construction of test items based on the revised Bloom's taxonomy 6.8 Test standardization 6.7 Item analysis: Item difficulty, discrimination index and reliability measurement 6.8 Computer-based testing 6.9 Portfolio and e-portfolio development 6.10 Letter grading system 6.11 Environmental science rubrics
Note on the assignment and activities: Do the following tasks/ activities. • *Develop a model specification chart for environment education.* • *Design an environment theory test item from the environment lesson for different levels of cognitive domain. Administer and calculate the item difficult and discrimination index.* • *Design online testing tools for environment education.* • *Design a rubric for evaluating the knowledge and skills in environment education.* • *Design the E-portfolio of students.*	

4 Instructional Strategies

The instructional strategies will be of the blended type including face to face contact sessions and online and distance mode interactions. The students will get ample opportunities to study themselves by the use of the SLM, books, articles and e-resources provided by course facilitator.

Students will be provided with the learning materials through different e-platforms and handouts during the contact sessions. There will be regular interactions among the peers and with the facilitator through virtual meetings/conferences. The students will have to read articles, review them, select specific areas and prepare journal article manuscripts for publication

4.1 General Techniques

- Online lecture and question-answer
- Participatory activities
- Inquiry: Generating questions and answers through dialogues
- Internet search

4.3 Specific Instructional Techniques

Units	Specific Instructional Technique	Remarks
1	Document study, Debate, and Manuscript writing	
2	Curriculum Review	
3	Workshop cum discussion	
4	Virtual conference	
5	Collaborative work	
6	Workshop, survey and report writing	

Note: The mode of delivering the course is online. A short presentation will be given before or after the activities by the faculty members/facilitator and the teacher experts during the contact sessions about the overall course plan, time schedule, modes of lesson delivery, assessment systems, and so on.

5. Evaluation

Nature of the course	Internal Assessment	Semester Examination	Total Marks
Theory	40 marks	60 marks	100 marks

Note: Students must pass separately in internal assessment and semester examination.

5.1. Internal Evaluation (40 Marks)

The internal evaluation will be conducted by the facilitator based on following activities:

1.	Attendance (Contact session and discussion forums)	5 marks
2.	Students learning engagement	5 marks
3.	Assignment I	10 marks
4.	Assignment II	10 marks
5.	Assignment III (Project work/review books/journal articles/dissertations)	10 marks
	Total	**40 marks**

External Evaluation (Final Examination) (60 marks)

Examination Division, Office of the Dean, Faculty of Education will conduct the final examination at the end of the semester. The marks distribution will be as follows

1.	Objective type question (Multiple choice question 10 x1mark)	10 marks
2.	Short answer questions (6 questions with 2 or questions × 5 marks)	30 marks
3.	Long answer questions (2 questions with 1 or questions × 10 marks)	20 marks
	Total	**60 marks**

Note: The marking system will be changed to the CGPA system as per the rule and regulation of the Academic Council, Tribhuvan University.

Recommended books and references and online materials

Amos, S., and Boohan, R. (2002). *Aspects of teaching secondary science: Perspective on practice*, New York & London: Routledge Taylor and Francis Group.

Gupta, V.K. (2005). *Teaching and learning of science and technology*, New Delhi: Vikas Publishing House.

Howarth, S. & Scott, L. (2014). *Success with STEM: Ideas for the classroom, STEM clubs and beyond.* Oxon: Routledge **(For Unit II)**

https://www.researchgate.net/publication/291126212

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Lakshmi, S.G.V., Subbaiah, G.L. and Rao D.B. M. (2004). Methods of teaching environmental science. New Delhi: Discovery Publishing House.

Levine, M., Serio, N., Radaram, B., Chaudhuri, S., & Talbert, W. (2015). Addressing the STEM gender gap by designing and implementing an educational outreach chemistry camp for middle school girls. *Journal of Chemical Education*, *92*(10), 1639-1644. **(For Unit I)**

Mohan, R. (2007). Innovative Science Teaching. New Delhi: Prentice-Hall of India Pvt. Ltd.

Pant, R.R., and Acharya, K.P. (2021). *Teaching Environment: Methods and Perspectives.* Intellectuals Book Palace, Kirtipur Kathmandu Nepal.

Sharma, S., and Singh P.P. (2005). Teaching of Environment: New Trends and Innovations. New Delhi: Deep and Deep Publications PVT. LTD.

Sood, J. K. (2009). *Teaching of Science*. New Delhi: Prentice Hall of India.

Faculty of Education
Office of the Dean
Balkhu, Kathmandu

Third Semester Course

Ed. 601: Teaching Practice

Course No: Ed. 601

Level: Three Semester M. Ed.

Semester: Third

Nature of course: Practical

Credit Hours: 6

Teaching Hours: 2 Credit on Campus and 4 Credit Hours in School

1. **Course Description**

This course is designed to provide hands-on experiences to the students in the area of their profession for enabling them to be competent teachers/professionals. It creates enabling conditions to the students for bringing professionalism through rigorous practice. The students will gain professional experiences through online and campus and in cooperating schools or campuses under the close supervision of different level supervisors. In this course, the students undertake the following major activities :**Micro Teaching, Material** Development, LMS development, Test construction and analysis, Action research, Teaching at school and Overall report writing.

2. **General Objectives**

The general objectives of this course are as follows:

- To provide adequate learning experiences to the students for making them competent in preparing effective lesson plans with appropriate teaching techniques and teaching aids according to the content to be taught
- To enable the students to construct, administer, analyse and interpret appropriate tests according to the contents to assess the effectiveness of their own teaching
- To develop skills of report preparation of teaching practice programme

3. **Specific objectives and Major activities**

Specific Objectives	**Major Activities**
Stage I : Micro teaching (6 hours)	
• Prepare micro lesson plans and required teaching aids for the lessons.	1.1 Preparation of at least 5 micro lesson plans using different teaching methods 1.2 Preparation of teaching aids 1.3 Online Micro teaching practice (at least 2 lessons teaching)
Stage II: Material and LMS Development (9 hours)	

• To explorer the digital tools of the discipline for material production • To produce student cantered teaching learning materials using digital tools • To prepare a sample of operational calendar, work plan and unit plan • To prepare specification chart • To construct test items. • To explorer open source LMS • To explorer the ID for online and virtual learning • To prepare LMS for the discipline.	2.1 **Material Development** 2.1.1 Digital tools of the discipline 2.1.2 Production of Digital materials **2.2 Planning** 2.2.1 Preparation of Calendar 2.2.2 Preparation of work plan 2.2.3 Preparation of unit plan **2.3 Practice of Test Construction** 2.3.1 Construction of specification chart 2.3.2 Test construction of both subjective as well as objective test item using different approaches **2.4 Learning Management System** 2.5 **Instructional Design (ID)** 2.6 **ID in LMS**
Stage III : Teaching at School/Campus (30 hours)	
• To Prepare and implement teaching module through LMS • To develop digital e-portfolio • To develop test item based on the grid • To analyse the test item • To conduct co-curricular activities in the cooperating School.	**3.1 Class teaching** **3.1.1** Teaching at least 20 lessons in utilizing resources (text, media, interactive) and activities (quiz, lesson, discussion, assignment) through LMS **3.2 Action research** 3.2.1 Conduction of action research addressing various educational issues 3.2.2 Preparation and execution of action research report **3.3 E-portfolio management** **3.4 Peer Observation** 3.4.1 Observation of teaching by peers (1 lesson) **3.5 Test Analysis** 3.5.1 One Set Test construction of both subjective as well as objective test

	item 3.5.2 Test Administration (n>30) 3.5.3 Test Analysis (Item analysis) 3.6 **Co-curricular activities**
Stage V: Overall Report Writing (3 hours)	
• Prepare an overall report of the teaching practice.	4.1 Preparation of overall report of teaching practice

4. Evaluation of Teaching Practice

Distribution of marks (Full Marks: 100)

Headings	Micro teaching, Materials and LMS development	Teaching at School/Campus			Total
	Internal (15%)	Internal (40%)	Concern Campus (5%)	External (40%)	
1. Teaching Performance					
1.1. Teaching plan	2	4		4	10
1.2 Teaching aids	1	3		2	6
1.3 Knowledge of subject matter	2	4		4	10
1.4 Teaching Strategies	2	4		6	12
1.5 Students teacher's Impression			3	4	7
1.6 Regularity/ E-portfolio	2	2	2		6
2. Material Development	2			3	5
3. LMS design	2	3		3	8
4. Action research		5			5
5. Test construction and analysis	2	4			6
6. Peer Observation					1

7. **Extra activity**		2			2
8. **Overall Report writing**					
8.1 Presentation		4		8	12
8.2 Overall organization of the report		4		6	10
Total	15	40	5	40	100

5. Reference Materials

American Psychological Association (2010).*Publication manual of the American Psychological Association (6th ed.)*. Washington DC: Author.

Baepler, P., Walker J. D., Brooks, D. C. (2016). *A Guide to teaching in the active learning classroom: History, research, and practice*, Virginia: Stylus Publishing.

Baharain Teachers College. (2008). Teaching practice: Student teacher handbook. Baharain: Baharain University. https://www.yumpu.com/en/document/view/39731053/student-teacher-handbook-bahrain-teachers-college

Cohen, L., Manion, L., Morrison, K., & Wyse, D. (2010) *A guide to teaching practice (5th ed.)*. New York and London: Routledge.

Petty, G. (2009). *Teaching today: A practical guide (4th ed.)*. CHELTENHAM: Nelson Thornes Ltd.

School of Education.(2013). *Teaching practice handbook.* Cape Town: University of Cape Town.http://www.education.uct.ac.za/sites/default/files/image_tool/images/104/tphandbook_0.pdf

Singh, Y.K. (2008). *Teaching practice: Lesson planning*. New Delhi: A P H Publishing Corporation.

Sockett, H. T., DeMulder, E. K., LePage, P. C., & Wood, D. R. (2001). *Transforming teacher education: Lessons in professional development*. London: Bergin & Garvey.

Sc. Ed. 602: Thesis Writing Nature of the Course: Practical
Course No: Sc. Ed. 602 Credit Hours: 6 (1 for Academic Writing, Proposal, 2 for Proposal Writing and 3Cr Thesis Writing.
Level: Two Semester M.Ed. Duration: Throughout the semester
Semester: ~~Second~~ Third Total Hours: 96

1. Course Description

This course is designed to provide the students with hands-on experience in preparing a research report in the form of a thesis work. The overall aim of this course is to enable students to acquire in-depth knowledge and skills for developing research proposal, conducting research and writing a research report as a thesis under the given format.

The course is divided into three parts: Academic writing, proposal writing and writing of thesis. Academic writing introduces the basic concepts of writing for academic purpose; proposal writing presents the basic components of a research proposal and prepares the students to develop a proposal in the area of their interest in their major subject. The third part engages the students in actually writing a thesis in the area of their choice, probably on the theme already selected for the proposal. The students are therefore encouraged to prepare a proposal into the form of a thesis if they would like to extend, elaborate and develop the proposal into an actual research work- thesis. They are also required to prepare the proposal and present it for acceptance and evaluation. So is true with thesis which demands a systematic investigation of a problem/theme under the guidance and supervision of a thesis supervisor.

2. General Objectives

The general objectives of this course are as follows:

- To make the students conversant with basic concepts, processes and techniques of academic writing, proposal writing and thesis writing.
- To prepare the students to write a research proposal on a researchable problem.
- To enable the students to write a thesis report in a standard given format.
- To make the students able to apply different approaches and methods of research while writing a thesis.

3. Specific Objectives and Contents

Specific Objectives	Contents
• Clarify the concept of academic writing • State the parameters of academic writing • Explore the process of academic writing • Identify the techniques of academic writing	**Unit I: Academic Writing (10)** 1.1 Concept of academic writing 1.2 Parameters of academic writing 1.3 Process of academic writing 1.4 Techniques of academic writing 1.5 Paragraph structure and paragraph writing 1.6 Paraphrasing and avoiding plagiarism
• State the prerequisites of a research proposal • Explain the concept of a research proposal • Discuss the components of a research proposal • Identify a researchable problem with its research	**Unit II: Prerequisites of a Research Proposal (10)** 2.1 Concept of a research proposal 2.2 Components of a research proposal 2.3 Language of a research proposal-the tense and sensitivity 2.4 Identification of a researchable problem 2.5 Developing the researchable problem into objectives 2.6 Developing research questions 2.7 The research design

objectives/questions • Develop research design	
• State the prerequisites of a thesis • Explain the concept of the structure of a thesis • Use language in a neutrally responsive way to avoid discrimination • Relate the review of the literature to the theme of the research • Explain the conceptual-theoretical framework • Derive themes from the objectives of the research • Draw implications/ conclusions	**Unit III: Prerequisites of Thesis Writing (10)** 3.1 Concept of the structure of the thesis-qualitative, quantitative, qual-quan. Structure(mixed) 3.2 Language of the thesis: Tense, gender responsiveness, poverty sensitivity and non-discriminatory 3.3 Relating the trio: objectives-themes of discussion and recommendations 3.4 Reviewing the literature: how to relate it to the thesis 3.5 The conceptual- theoretical framework 3.6 Deriving themes and discussing them in relation to the objectives 3.7 Drawing implications/conclusions
• Develop the skills of writing a research proposal with necessary components • Develop the research proposal • Present the proposal in a systematic way • Apply the APA style of writing the proposal in an organized way.	**Unit IV: Proposal Writing (20)** • **Cover page** of the proposal with title, details of the researcher and the level for which it is written. • **Table of contents** • **Acronyms/ Abbreviations** • **List of tables** (If necessary) • **List of figures**(If necessary) • **List of charts and graphs**(If necessary) CHAPTER ONE: INTRODUCTION 1.1 Background of the study 1.2 Statement of the problem 1.3 Objectives of the study 1.4 Research question/s (if necessary) 1.5 Significance of the study 1.6 Delimitations of the study 1.7 Definition of the key terms CHAPTER TWO : REVIEW OF RELATED LITERATURE AND THEORETICAL FRAMEWORK 2.1 Review of related literature 2.2 Theoretical/Conceptual framework 2.3 Implications of the review for the research CHAPTER THREE:METHODS AND PROCEDURES 3.1 Research design (qualitative, quantitative and mixed design) 3.2 Population and sample 3.3 Sampling strategy and procedures 3.3 Research tools 3.4 Sources of data (primary and secondary) 3.5 Data collection procedures 3.6 Data analysis procedures 3.7 Ethical considerations REFERENCES (APA format)

	APPENDICES (list of respondents, tools, raw data, tables etc.)
• State the ingredients of a thesis in a research way • Write the thesis by following the given format • Follow the APA style of research report writing while writing the thesis • Present the thesis in an organized way to face the viva voce in a confident way.	**Unit V :Thesis Writing (46)** CHAPTER ONE : INTRODUCTION 1.1 Background of the study 1.2 Statement of the problem 1.3 Objectives of the study 1.4 Research question/s (if necessary) 1.5 Rationale of the study 1.6 Delimitations of the study 1.7 Definition of the key terms
	CHAPTER TWO:REVIEW OF RELATED LITERATURE AND THEORETICAL FRAMEWORK 2.1 Review of related literature 2.2Theoretical/Conceptual framework 2.3 Implications of the review for the research
	CHAPTER THREE :METHODS AND PROCEDURES 3.1 Research design(qualitative, or quantitative or mixed method) 3.2 Population and sample 3.3 Sampling strategy and procedures 3.3 Research tools 3.4 Sources of data 3.5 Data collection procedures 3.6 Data analysis procedures 3.7 Ethical considerations
	CHAPTER FOUR:ANALYSIS AND INTERPRETATION OF RESULTS
	CHAPTER FIVE : SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Note: The research format is an outline of necessary components of a research report for writing the thesis. The format for writing the thesis report is given below:

- **Cover page** of the thesis with title, details of the researcher and the level for which it is written.
- **Recommendation letter** (letter head of the department/campus)
- **Approval letter** (letter head of the department/campus)
- **Acknowledgement**(Few words of gratitude to the contributors of the thesis)
- **Abstract** (include in not more than one and half pages or in 350 to 400 words an abstract of the thesis with the **topic, major objective, method and procedure, main findings** and **recommendations** of the study).
- **Table of contents**
- **Acronyms/ Abbreviations**
- **List of tables** (If necessary)
- **List of figures**(If necessary)
- **List of charts and graphs**(If necessary)

4. Instructional techniques: This course on thesis writing is divided between theoretical presentation of the requirements and ingredients of the thesis and actual writing of it for presentation and evaluation as a part of the degree program. The theoretical part of the thesis acquaints the students with the art and skills of preparing a thesis as a research work. The practical aspect of the course is related to the actual writing of the thesis in a given format by applying the skills of writing a research report. The students are therefore provided a thorough orientation to the art and skills of writing a thesis before they actually start writing it as a requirement of the degree program. The teacher therefore presents a detailed discussion on academic writing, proposal writing and thesis writing in order to prepare the students to write a proposal and present it for evaluation. This can be done either by the expected thesis supervisor or by any other teacher teaching research methodology course to the students.

5. Evaluation

5.1 Internal Evaluation **30%**

Internal evaluation will be conducted by the course teacher as following:

1	Academic writing (written test)	10 points
2	Proposal writing(preparation and presentation)	20 points
	Total	**30 points**

5.2 External Evaluation (Final Examination) **70%**

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

3. Thesis writing (preparation and presentation)

a. External evaluator to the thesis	35 points
b. Thesis supervisor	35 points
Total	**70 points**

6. Recommended Books and Reference Materials

Recommended Books

American Psychological Association.(2010). *Publication manual of American Psychological Asssociation.*(6th ed.). Washington, DC: APA.

Cohen, L., Manion, L., & Morrioson, K., (2010). *Research methods in education.* Noida, India: Sirohi Brothers.

Creswell, John W. (2011). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research.* (4th ed.). New Delhi: PHI Learning Pvt. Ltd.

References

Best J.W., & Kahn J. V.(2012). *Research in education.* New Delhi: Prentice Hall of India Pvt. Ltd.

Denizen, N. K., & Lincoln, Y. S. (Eds.).(2005). *Handbook of qualitative research.* London: Sage Publication.

Hancock, B.(2002). *An introduction to qualitative research.* Nottingham: Trent Focus Group.