

Course Title: ICT in Mathematics Education

Course No: Math. Ed. 444

Year:4th

Level: 4 yrs. B. Ed.

Nature: TH + PR

F. M.100

TeachingHours:225(75 T +150P )

### 1.Course Description

This course is designed to provide the students with basic skills and knowledge on use of Information Communication Technology (ICT) in mathematics education. It comprises basic literacy, knowledge and skills of handling mathematical software GeoGebra and others particularly focusing on school related various topics of mathematics.

### 2.The General Objectives

General objectives of this course are as follows:

- To apply and work with basic digital literacy skills in teaching learning.
- To make students familiar with GeoGebra to design dynamic and interactive teaching learning resources.
- To understand learning management system for teaching learning purpose

### 3. Specific Objectives and Contents

Specific Objectives	Contents
<ul style="list-style-type: none"><li>• Explain the difference of ICT and ICT education in terms of aims, contents and practices.</li><li>• Sketch the historical development of ICT and ICT in education in the world.</li><li>• Compare the ICT policy and practice in Nepalese education.</li></ul>	Unit I: ICT and ICT Education (5T) 1.1 Meaning of ICT and ICT education 1.2 ICT use in education in different countries a review (South Korea, Philippines and Sri Lanka) 1.3 ICT in education in Nepal: ICT policy, ICT in Education , Master plan and programs 1.4 Practices of ICT in education in Nepal
<ul style="list-style-type: none"><li>• Describe the implication of learning theories in using different educational software and tools that are used in education.</li><li>• Identify and select appropriate web sites for instructional support</li></ul>	Unit II: Learning theories and ICT tools (5T) 2.1 Behaviuorism, cognitivism, constructivism, connectivism 2.2 Use of ICT tools for related learning theory principles 2.3 Learning through networking: Web 2.0 and E-learning 2.0
<ul style="list-style-type: none"><li>• State the inclusion of ICTs in school curriculum in different subjects.</li><li>• Explain the needs of ICT competencies for a teachers based on different professional standards</li></ul>	Unit III: ICTs in Curriculum and Professional Standards (5T) 3.1 Review of the curriculum framework and professional standards of teachers in relation to ICT use for different subjects 3.2 ICT competencies in different professional standards (UNESCO and NCED Nepal).
<ul style="list-style-type: none"><li>• To enhanced the skill to operate the operating system</li><li>• To handle ICT devices and</li></ul>	Unit IV: Operating System and Computer Hardware (5T+10P) 4.1 Introduction to computer system

<p>use them in learning facilitation</p>	<p>4.2 Basic component of computer system  4.3 Computer hardware and their installation for use (printer, digital camera, scanner, projector, flash drive etc.)  4.4 Introduction to mobile devices.  4.5 Operating system (desktop, file and folder management, user account and password protection, font installation).</p>
<ul style="list-style-type: none"> <li>• To work with basic text formatting skills in word processor</li> <li>• Design power points for different purpose of presentation for different subjects and issues</li> <li>• Design spreadsheet as per needs of teaching learning tasks</li> </ul>	<p>Unit V: Basic Digital Literacy for Teachers – Word processor, spread sheet and presentation (10T+30P)</p> <p>5.1 Working with word processor (text formatting, page setting, table and object insert, review and citation on documentation)</p> <p>5.2 Power point designing and use (creating presentation, inserting pictures, charts, audio, video, formatting presentation, layout, animation, slide transition)</p> <p>5.3 Designing and use of spread sheet (worksheet and workbook, cell referencing, basic functions and formula, Insert charts, Case: Analyze the students' achievement score)</p>
<ul style="list-style-type: none"> <li>• Create emails and use it for communication (using full features in email)</li> <li>• Use ICT gadgets and multimedia for creating contents for learning (audio, video, text etc)</li> <li>• Design blog and use in education</li> <li>• Design and disseminate a blog</li> <li>• Design and develop lessons in Moodle</li> </ul>	<p>Unit VI: Communication Tools, Multi-media and Their Use in Teaching and Learning (10T+25P)</p> <p>6.1 Use of Internet and email  6.2 Use of Search Engine  6.3 Use of Social Media  6.4 Use of cloud computing tools to store and share documents (Google Drive, OneDrive)  6.5 Multimedia and its use (text, image, animation, audio and video) in teaching and learning.  6.6 Recording audio, video, (audacity, movie-maker) for podcast and vodcast learning materials.  6.7 Video conference and webinar tools.  6.8 Blog and its use in education (Google/WordPress)  6.9 Moodle in education (teacher and student, resources and activities)</p>
<ul style="list-style-type: none"> <li>• Explain the cyber security laws and issues</li> <li>• Use ICTs with full ethical consideration</li> <li>• Create awareness program for students in security, ethics</li> </ul>	<p>Unit VII: Security and Ethical Consideration in ICT use (5T+ 10P)</p> <p>7.1 Computer system protection from malware and spyware  7.2 Information Security  7.3 Protection from Cyber security and</p>

<p>and use and misuse of ICTs</p>	<p>Cyber Crime 7.4 Online safety methods. 7.5 Ethics in using digital documents, ICT use and communication 7.6 Use and misuse of ICTs</p>
<ul style="list-style-type: none"> <li>• Design applets for factor kids and zeros of polynomials</li> <li>• Design interactive applet on triangle centers (centroid, in-center, orthocenter, circum-center, ex-center)</li> <li>• Design applets for triangles (angle sum, median triangle, orthic triangle, cevian triangle)</li> <li>• Design applets for cyclic quadrilateral, nine-point circle, and conics</li> <li>• Visualize solids in 3D environment</li> <li>• Visualize and label the parts of solids</li> <li>• Visualize frustum of solids</li> </ul>	<p>Unit VIII: Teaching Mathematics Using GeoGebra (10T+30P)</p> <p>8.1 Arithmetic: place value, addition, multiplication, HCF and LCM, fraction</p> <p>8.2 Algebra: factorization, factor and remainder theorem, zeros of polynomial, matrix and determinants</p> <p>8.3 Geometry: triangle, quadrilateral, circle coordinate geometry, conic section</p> <p>8.4 3D Teaching cube/cuboid, cylinder, cone, prism, pyramid, frustum, sphere</p>
<ul style="list-style-type: none"> <li>• Design interactive applet for unit circle</li> <li>• Visualize trig fundamentals (periods, window, domain and range)</li> <li>• Visualize univariate discrete and continuous pdf</li> <li>• Visualize binomial distribution</li> <li>• Visualize normal distribution</li> </ul>	<p><b>Unit IX: Teaching Trigonometry and Statistics using GeoGebra (10T+25P)</b></p> <p>9.1 Unit circle, trigonometric functions and values, periods, principal window, principal solution, domain and range</p> <p>9.2 Probability distribution, discrete pdf, continuous pdf, data visualization and modeling</p>
<ul style="list-style-type: none"> <li>• Visualize limit definition</li> <li>• Design applet for continuity test</li> <li>• Design applet for derivative and higher order visualization</li> <li>• Design applet for integral</li> <li>• Use online apps for content visualization</li> <li>• Use mobile apps for mathematics learning</li> <li>• Use Microsoft Mathematics user interface</li> </ul>	<p><b>Unit X: Teaching Calculus Using GeoGebra and Mobile Applications in Math Education (10T +20P)</b></p> <p>10.1 Limit [epsilon delta definition]</p> <p>10.2 Continuity</p> <p>10.3 Derivative and higher order</p> <p>10.4 Integration</p> <p>10.5 Online version of Wolfram apps</p> <p>10.6 Mobile applications (MaMath)</p> <p>10.7 Microsoft mathematics</p>

## Instructional Techniques

### 4.1 General Instructional Techniques

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

- Lecture
- Demonstration
- Discussion
- Group Work

### 4.2 Specific Instructional Techniques (Practical)

Unit	Activity and Instructional Techniques	Hours (225)
1-2	<ul style="list-style-type: none"><li>• Develop multimedia presentation.</li><li>• Assign project work</li></ul>	10
3-9	<ul style="list-style-type: none"><li>• Modeling on mathematical content</li><li>• Assign project work</li><li>• Students presentation</li></ul>	170
10	<ul style="list-style-type: none"><li>• Demonstration</li><li>• Project work-blogging</li><li>• Presentation</li></ul>	45

## Evaluation

### 5.1 Theory: External Examination (Full Marks 50)

The Office of the Controller of the Examination will conduct annual examination at the end of the academic session to evaluate student's performance. The types, number and marks of the subjective and objective questions will be as follows.

Types of questions	Total questions to be asked	Number of questions to be answered and marks allocated	Total marks
Multiple choice items	10 questions	10x1 mark	10
Short answer questions	4 with 2 alternative questions	4x7 marks	28
Long answer questions	1 with 1 alternative question	1x12 marks	12

### 5.2 Practical Examination (50 marks )

#### 5.2.1 Internal Evaluation (Subject Teacher) (20marks )

Subject teacher will keep log record of students' practical activities, and assign marks internally for 20 points. The subject teacher will consider following framework as guideline for his/her internal evaluation.

#### Framework( or Guideline )for Internal Evaluation :

Units	Unit-wise weightage in Pr( periods)	
	Hrs	Marks

I	0	-
II	0	-
III	0	0
IV	10	2
V	30	4
VI	25	3
VII	10	1
VIII	30	4
IX	25	3
X	20	3
Total	150	20

### 5.2.2 External Evaluation (30 marks )

The Office of the Controller of the Examination will appoint an external examiner to conduct final practical examination at the end of the academic session .He /She will conduct final practical examination as mentioned in the framework given below or as designed by internal and external examiners.

#### Framework (or Guideline )for External Evaluation:

Units	Unit-wise weightage inPr( periods)	
	Hrs.	Marks
I	0	-
II	0	-
III	0	0
IV	10	2
V	30	6
VI	25	5
VII	10	2
VIII	30	6
IX	25	5
X	20	4
Total	150	30

*Note: Students must pass separately in theory and practical examinations.*

### 6. Recommended Learning Resources

A compendium of teaching learning material will be developed by FOE, Dean's Office,

Kirtipur specifying following components unit-wise.

- Learning Contents
- Learning Objectives
- Learning Resources
- Learning Activities/Guided Activities
- Learning Assessment/Evaluation

## References

- Marcelino, M. J., Mendes, A. J., & Gomes, M. C. A. (Eds.). (2016). *ICT in Education*, Cham: Springer International Publishing.
- Harasim, L. M. (2012). *Learning theory and online technology*. New York, NY: Routledge.
- Hall, J., & Lingefjärd, T. (2017). *Mathematical modeling: applications with GeoGebra*. Hoboken, New Jersey: John Wiley & Sons, Inc.
- ICT competency standards for teachers: competency standards modules, Imprint: 2008, UNESCO
- ICT Education Master Plan 2013-2018, Ministry of Education, 2014
- National Information Communication Technology Policy 2012, Ministry of Communication and Information Technology.
- Alexis Leon & Mathews Leon (2009). *Fundamentals of Information Technology*, 2/e. New Delhi. Vikas Publishing House (unit 1-5)
- Morley, D. &. (2013). *Understanding Computers Today and Tomorrow*. Cengage Learning.
- Cox, J., Lambert, J., & Frye, C. (2011). *Microsoft Office Professional 2010 step by step*. Redmond, Wash: Microsoft.
- Patrice-Anne Rutledge(2014), *Office 2013 All-In-One Absolute Beginner's Guide* ISBN:9789332539372 , Pearson India