Course Title: **Java Programming**

Course No. : ICT. Ed 455 Nature of course: Theoretical + Practical

Level: B.Ed. Credit Hour: 3 hours (2T+1P)

Semester: Fifth Teaching Hour: 80 hours (32+48)

1. **Introduction:**

This course covers different concepts of computer programming using Java programming language. The course covers ideas of programming including comments, data type, operators, variables, constants, control statements, arrays, classes and objects, inheritance and interfaces, packages, exception handling, input/output, event handling, swing and JDBC.

1. **Course Objectives:**

After the completion of this course, the students should be able to:

* + Explain the Java programming environment
  + Describe the concepts of programming elements using Java and object-oriented programming concepts
  + Apply the exception handling and input/output in Java programming
  + Apply the event handling, GUI programming using swing, and Java database connectivity

1. **Course Outlines:**

|  |  |
| --- | --- |
| **Specific Objectives** | **Contents** |
| * Understand the basic concept of java programming | **Unit 1: Introduction to Java (3)**  1.1. Java as a Programming Platform  1.3. The Java “White Paper” Buzzwords  1.4. A Short History of Java  1.5. Writing Simple Java Programs |
| * Explain the data types and variable. * Use control flow and array | **Unit 2: Fundamental Programming Structures (12)**  2.1. Writing Comments  2.2. Basic Data Types  2.3. Variables and Constants  2.4. Operators  2.5. Type Casting  2.6. Control Flow  2.7. Arrays |
| * Explain the principles of the object-oriented programming | **Unit 3: Objects and Classes (10)**  3.1. An Introduction to Object-Oriented Programming  3.2. Using Predefined Classes  3.3. Defining Your Own Class  3.4. Static Fields and Methods  3.5. Method Parameters  3.6. Object Construction  3.7. Packages |
| * Learn abstraction, encapsulation, * inheritance and polymorphism | **Unit 4: Inheritance and Interfaces (6)**  4.1. Classes, Super classes, and Subclasses  4.2. Polymorphism  4.3. Dynamic Binding  4.4. Final Classes and Methods  4.5. Abstract Classes  4.6. Access Specifies  4.7. Interfaces |
| * Design and develop java error handling software | **Unit 5: Exception Handling and Multithreading (3)**  5.1. Dealing With Errors  5.2. Catching Exceptions  5.3. try, catch, throw, throws, and finally |
| * Use input and output mode in java | **Unit 6: Input/output (4)**  6.1. Input/output Basics  6.2. Console Input and Output  6.3.Reading and Writing Files |
| * Handle the events with MVS and Swing Component | **Unit 7: Event Handling and User Interface Components with Swing (6)**  7.1. Basics of Event Handling  7.2. Event Classes  7.3. Event Listeners and Adapter Classes  7.4. Swing and the MVC Design Pattern  7.5. Layout Management  7.6. Basic Swing Components |
| * Connect the data and java interface using JDBC | **Unit 8: Java Database Connectivity (4)**  8.1. The Design of JDBC  8.2. Executing SQL Statements  8.3. Query Execution |

1. **Instructional Techniques**

The instructional techniques for this course are divided into two groups. First group consists of general instructional techniques applicable to most of the units. The second group consists of specific instructional techniques applicable to particular units.

**4.1 General Techniques**

Reading materials will be provided to students in each unit. Lecture, Discussion, use of multi-media projector, brain storming are used in all units.

**4.2 Specific Instructional Techniques**

Demonstration is an essential instructional technique for all units in this course during teaching learning process. Specifically, demonstration with practical works will be specific instructional technique in this course. The details of suggested instructional techniques are presented below:

**Laboratory Work:** The laboratory work includes writing programs to understand all theprogramming concepts of Java including data types, operators, control statements, objects and classes, inheritance, interface, exception handling, input/output, event handling, swing and JDBC.

1. **Evaluation :**

|  |  |  |  |
| --- | --- | --- | --- |
| **Internal**  **Assessment** | **External Practical**  **Exam/Viva** | **Semester**  **Examination** | **Total**  **Marks** |
| 40 Points | 20 Points | 40 Points | 100 Points |

***Note****: Students must pass separately in internal assessment, external practical exam and semester**examination.*

**5.1. Internal Evaluation (40 Points):**

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

|  |  |
| --- | --- |
| 1. Class Attendance | 5 points |
| 1. Learning activities and class performance | 5 points |
| 1. First assignment ( written assignment) | 10 points |
| 1. Second assignment (Case Study/project work with presentation ) | 10 points |
| 1. Terminal Examination | 10 Points |
| Total | 40 Points |

**5.2 Semester Examination (40 Points)**

Examination Division, Dean Office will conduct final examination at the end of semester.

|  |  |
| --- | --- |
| 1. Objective question (Multiple choice 10 questions x 1mark) | 10 points |
| 1. Subjective answer questions (6 questions x 5 marks) | 30 points |
| Total | 40 points |

**5.3 External Practical Exam/Viva (20 Points):**

Examination Division, Dean Office will conduct final practical exam at the end of semester.

1. **Recommended books and References materials (including relevant published articles in national and international journals)**

**Recommended books:**

**References:**

Core java Volume I – Fundamentals, Ninth Edition, Cary S. Horstmann and Gary Cornell

Core java Volume II – Advanced Features, Ninth Edition, Cary S. Horstmann and Gary Cornell

Java: The Complete Reference, Ninth Edition, Herbert Schildt

Effective Java, Third Edition, Joshua Bloch

Head First Java, 2nd Edition, Kathy Sierra and Bert Bates

Course title: **Fundamental of Curriculum**

Course No.: Ed 451 Nature of Course: Theoretical

Level: B.Ed. Credit Hours: 3hours

Semester: Fifth Teaching Hours: 48 hours

1. **Course Description**

This course is designed for providing students with fundamental concept of curriculum and curriculum development. The course intends to equip students with knowledge on the bases of curriculum development and its components. Further, it aims at providing students with general understanding of the process of curriculum development and study of existing school level curriculum of Nepal.

1. **General Objectives**

The general objectives of this course are listed below:

* + To acquaint students with different meanings of curriculum.
  + To make students familiar with various bases of curricular decisions.
  + To enable students to figure out various components of curriculum.
  + To make students familiar with the curriculum development process and existing school level curriculum of Nepal
  + To equip students with skill of preparing some components of curriculum.

1. **Specific Objectives and Contents**

|  |  |
| --- | --- |
| **Specific Objectives** | **Contents** |
| * Explain different meanings of curriculum | **Unit 1: Introduction to Curriculum (5)**  1.1. Curriculum as subject  1.2. Curriculum as courses of study and syllabus  1.3. Curriculum as experiences  1.4. Curriculum as objectives  1.5. Curriculum as plan of learning. |
| * Identify bases for curricular decisions. * Relate different philosophical bases with curriculum. * Justify the need of studying society and culture for curriculum development. * Exemplify socio-cultural factors to be addressed by curriculum. * Identify various nature of knowledge. * Elucidate how nature of knowledge influences the curricular decisions. * Clarify why need, interest and maturation of child should be addressed by curriculum * Explore ways of addressing the need of children with special needs. | **Unit 2: Bases for Curricular Decision Making (17)**  **2.1 Philosophical bases**  2.1.1 Philosophy and curriculum  2.1.2 Idealism and curriculum.  2.1.3 Naturalism and curriculum.  2.1.4 Pragmatism and curriculum.  2.1.5 Realism and curriculum  **2.2 Society and culture**  2.2.1 Society, culture and curriculum  2.2.2 Socio-cultural factors influencing curricular decisions  **2.3 Nature of knowledge**  • Knowledge as contents and process.  • Levels of contents  • Explosion and obsolescence of knowledge.  **2.4 Nature of learner**  • Need, interest and maturation level  • Learning needs of children with special needs. |
| * Explain aims, goals and objectives of curriculum. * Construct goals and objectives for various subjects. * Describe the criteria of selection and organization of content and learning experiences. * Justify the need of assessment/ evaluation of student learning | **Unit III: Curricular Components (17)**  3.1 Aims, goals and objectives  • Concepts and relationship  • Types of objectives: general and specific  • Classification of objectives: cognitive, affective and psychomotor  3.2 Content: selection and organization  3.3 Teaching-learning experiences  • Criteria of selecting and organizing Learning Experiences  • Teacher initiated and learner initiated experiences  3.4 Evaluation /assessment of student learning |
| * Identify the steps of curriculum development. * Describe the process of school curriculum development in Nepal. | **Unit 4: Process of Curriculum Development (5)**  4.1 Concept of Curriculum Development.  4.2 Steps of Curriculum Development.  4.3 School level Curriculum Development Process in Nepal. |
| * Assess the structure, goals, learning outcomes, teaching methods and evaluation process stated in the existing school curriculum of Nepal. | **Unit 5: Existing School Level Curriculum of Nepal (5)**  5.1. Level wise goals: Pre-Primary, Basic and Secondary  5.2. Structure of curriculum of each level  5.3. Components of subject-wise curriculum:  • Introduction  • Level wise competencies  • Grade wise learning outcomes  • Skills/ scope and sequence and elaboration of contents  • Facilitation Process for learning  • Assessment of student achievement  5.4. Review of school curriculum of Nepal |

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

1. **Instructional methods**

Two modes of instruction, general and specific, can be applied. General mode consists of techniques applicable to most of the contents whereas, specific ones are applicable to specific contents.

**4.1. General Methods**

This method requires following activities:

1. Introductory presentation on each topic of the unit by teacher. Lecture, discussion, question-answer, argumentative sessions.
2. Presentations by students.

**4.2 Special Methods**

**a) Unit II: Society and culture**

* + The students will be involved in discussion, brainstorming on the nature of Nepalese society and culture and explore the aspects to be addressed by curriculum. Presentation of the outcomes in the classroom followed by feedback.
  + Prepare an outline of some components of curriculum in subject of your interest.

1. **Unit IV: Process of Curriculum Development**
   * The students will consult concerned agency such as CDC and find out the process of school level curriculum development.
   * Presentation and discussion on pros and cons of curriculum development process in the classroom.
2. **Unit V: Existing school level curriculum of Nepal**
   * Group assignment on identifying structure of school curriculum.
   * The students will visit the school and observe the transaction of curriculum in classroom.
3. **Evaluation**

**5.1 Internal Evaluation 40%**

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

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| --- | --- |
| 1) Attendance | 5 |
| 2) Class participation | 5 |
| 3) First assignment (Group work based on unit I, II, III & IV) | 10 |
| 4) Second assignment (Pair work based on Unit V) | 10 |
| 5) Third assignment (Written test: objectives and subjective) | 10 |
| Total | 40 |

**5.2 Final/Semester Evaluation 60%**

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

|  |  |
| --- | --- |
| Objective type question (Multiple choice 10 x 1ponts) | 10 |
| Short answer questions (6 questions x 5 points) | 30 |
| Long answer questions (2 questions x 10 points) | 20 |
| **Total** | **60** |

1. **Recommended Books and references**

**Recommended Books**

Government of Nepal (2063 BS). *Primary Education Curriculum Grade 1-3 (Nepali Version)* , Sanothimi, Bhaktapur. Curriculum Development Center (UNIT V)

Government of Nepal (2065 BS). *Primary Education Curriculum Grade 3-4 (Nepali Version)* , Sanothimi, Bhaktapur. Curriculum Development Center (Unit V)

Government of Nepal. (2069 BS). *Basic Education curriculum Grade 6-8.* Sano thimi Bhaktapur. Curriculum development Center. (Unit V)

Government of Nepal (2063 BS). *National Curriculumk framework (Nepali Version)* , Sanothimi, Bhaktapur. Curriculum Development Center (UNIT IV)

Government of Nepal (2064 BS). *Local Curriculum Development Manual* *(Nepali Version),* Sanothimi, Bhaktapur. Curriculum Development Center (UNIT IV)

Ornstein, Allan and Hunkins, Francis P., (2004) *Curriculum: Foundations, principles and Issues*. Boston, USA, Allyn and Bacon (UNIT II).

Saylor . J. Galen and Alexander.William M. (1974*) Planning curriculum for schools.* New York, USA *.* Holt, Rinehart and Winston, Inc.(UNIT I)

Taba, Hilda (1962) *Curriculum Development, Theory and Practice* New York Harcourt, Brace & Inc.(UNIT II , III and IV)

Tyler. Ralph W.( 1974) *Basic Principles of curriculum and Instruction.* Chicago , USA. The University of Chicago. (UNIT III)

Wheeler, D.K. (1979) *Curriculum Process*. London, Great Britain Hodder and Stougton(NIT II and IV)

**References**

Print, Murray. ( 1988) . *Curriculum Development and Design.* NSW Australia. Allen and Unwin.

Ross S. James (2008) *Groundwork of Educational Theory* New Delhi India , Surjeet Publication.

Sowell, Evelyn J. (1996). *Curriculum: An Integrative introduction*. New Jersy, Prentice Hall Inc.

Tanner, D. & Tanner, L.N. (1980) *Curriculum development, theory into practice*, 2nd edition, New York: Macmillan Publishing Co., Inc.

Zais, Robert S. (1976). *Curriculum: Principles and Foundations.* New York. USA Harper and Row, Publishers.

**Course Title: Data Communication and Networks**

Course No.: ICT. Ed. 456 Nature of course: Theoretical + Practical

Level: B.Ed. Credit Hour: 3 hours (2T+1P)

Semester: Fifth Teaching Hour: 80hours (32+48)

1. **Course Description**

The purpose of this course is to introduce the fundamental concepts on data communication, Data transmission mechanisms, Network architectures, Internet protocols, Local area networks and the practical aspects of networking. At the end of this course, a student will be able to understand the fundamental concepts required for the design, deployment, and management of computer networks.

1. **General Objectives**

After successful completion of this course students will be able to

* + Identify the different components and their respective roles in a communication system
  + Propose efficient, cost effective, reliable and appropriate technology to establish communication links
  + Design an enterprise network employing the common LAN technologies and be able to evaluate the advantages and disadvantages
  + Configure a PC to work as a host in a TCP/IP network and to use the IP based commands to facilitate the trouble shooting process
  + Describe the technical issues related to the Wide Area Networks and identify the common technologies available in establishing WAN infrastructure
  + Describe the specific actions that can be taken to enforce network level security.

1. **Course Outlines:**

|  |  |
| --- | --- |
| **Specific Objectives** | **Contents** |
| * Describe the basic concept of communications and the electronic implementation of communications paradigms * Identify the characteristics and the analyze the signals properties * Identify the data rate limits in channels based on the Nyquist’s and Shannon’s theorem * Describe the parameters to measure the performance of channel | **Unit 1: Fundamentals of digital communications (5)**  1.1. Introduction to digital communications: Definitions of terms, Signal propagation, Signal types (Sine waves, Square waves), Signal parameters (Amplitude, Frequency, Phase).  1.2. Channel effects on transmission: Attenuation, Effects of limited bandwidth, Delay distortion, Noise.  1.3. Data rate limits in channels: Nyquist's theorem, Shannon's theorem.  1.4. Performance of Channel: Bandwidth, Throughput, Latency, Jitter, Bit Error Rate (BER)  **Practical Work**   * Demonstrate Sine and Square waves generation and analysis using MATLAB |
| * Describe how digital data can be transmitted using analog transmission facilities. * Map a binary pattern into a signal encoded using different encoding schemes * Select a suitable transmission medium/media for the implementation of a communication network * Recognize the constrains related to the practical usage of transmission media | **Unit 2: Physical layer characterization (12)**  2.1 Electromagnetic Spectrum for Communication and Type of Propagation  2.2 Guided Transmission Media: Twisted pair cables, Co-axial cables, Fibre optic cables  2.3. Unguided Transmission Media: Wireless media (Terrestrial Microwaves, Satellite Communication and Cellular System).  2.4. Physical Layer Interfaces: RS 232 / EIA 232/ USB.  **Practical Works:**   * Physical demonstration and explanation of different transmission media and physical layer interfaces |
| * Describe the design issues related to data transfer. * Describe both analog and digital modulation techniques. * Compare and contrast the circuit and packet switching technologies * Describe the concept and the use of multiplexing technologies * Describe error control mechanisms | **Unit 3: Data transmission mechanisms (20)**  3.1. Communication modes: Simplex, Half-duplex, Full –duplex.  3.2. Transmission modes: Serial transmission, Parallel transmission.  3.3. Synchronization: Asynchronous transmission, Synchronous transmission.  3.4. Modulation Techniques: Types of Analog Modulation (Amplitude Modulation, Frequency Modulation and Phase Modulation), Digital Modulation [Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), Phase Shift Keying (PSK), Quadrature Amplitude Modulation (QAM)]  3.5. Introduction to packet switching: Circuit switching vs. packet switching, Connection oriented services (Virtual circuits), Connectionless services (Datagram), X.25, Frame Relay and ATM.  3.6. Multiplexing: Frequency division multiplexing (FDM), Time division multiplexing (TDM), Wave division multiplexing (WDM).  3.7. Error control methods: Feedback error recovery (ARQ) (Eg: Based on parity check), Forward error correction (FEC) (Eg: CRC)  **Practical Works:**   * Demonstrate Analog Modulation Generation and Reconstruction using MATLAB * Demonstrate Digital Modulation (ASK, FSK, PSK) Generation and Reconstruction using MATLAB |
| * Describe the advantages of a layered architecture * Illustrate the roles of each layer in the OSI & TCP/ IP model two process and process communication. * Provide a description of the emergence and the evolution of computer networks * Discuss the selection of suitable geometric layout for a network based on the standard topologies * Outline the features of different types of computer networks | **Unit 4: Network architectures (8)**  4.1. Introduction to computer networks.  4.2. Network topologies: Bus, Star, Ring.  4.3. Types of networks: Local area networks, Wide Area Networks, Personal Area Networks.  4.4. Layered network model: OSI model, TCP/ IP model.  **Practical Works**   * Network wiring and LAN setup. |
| * Give a description of the TCP/IP protocol suite including the roles of major protocols * • Configure an IP address block into a given number of subnets. * Use the IP based diagnostic commands to support troubleshooting in IP networks. * Describe IP routing mechanisms * Describe the popular application layer protocols in the Internet * Recognize the limitations of IP version 4 and the advantages of IP version 6. | **Unit 5: Internet protocols (14)**  5.1. Introduction: History of the Internet protocols, Internet protocol stack, IP Addressing and Routing (Version 4), Subnetting: Fixed and variable length, Uni-cast routing algorithms.  5.2. Transport Layer protocols: TCP and UDP.  5.3. IP Support Protocols: ARP, DHCP and ICMP  5.4. Application Layer Protocols: Domain Name System (DNS), Email – SMTP, POP, IMAP, FTP, HTTP, RTP and VoIP.  5.5. IP version 6.  **Practical Works:**   * Setup of Web Server, DNS Server, DHCP Server |
| * Compare and contrast different LAN technologies such as IEEE 802 LAN standards. * Describe the problem of channel allocation in the LAN segments and the solutions used. * Design a large Ethernet network using hubs and switches and to suggest the suitable devices to provide the connectivity to the other outside networks. * • Describe the problems associated in deploying a wireless LAN and propose solutions. | **Unit 6: Local area networks (14)**  6.1. Introduction to LANs.  6.2. Conventional LAN Architectures: Access Protocols (CSMA/CD, Token Passing), Interconnecting devices (Hubs, L2 /L3 Switch)  6.3. IEEE 802 MAC layer standards : 802.3, 802.11, 802.15 Switched Ethernet variants: Fast Ethernet, Gigabit Ethernet, 10Gb Ethernet.  6.4. Wireless LANs (802.11): Access methods (CSMA/CA), Frequency Bands (ISM), Operating Modes (adhoc, Managed), Variants (802.11 a/ b/ g/ n), Wireless interconnection devices (Hub, Router).  6.5 Bluetooth (802.15) wireless personal area network.  **Practical Works:**   * Router Basic Configuration * Static and Dynamic Routing * Router access-list configuration |
| * Identify the techniques of securing a private network * Describe issues in structured cabling * Identify connecting options made available by service providers | **Unit 7: Practical aspects of networking (7)**  7.1. Structured cabling and specifications: Standards CAT5, 5E, CAT6 etc..  7.2. Network security: Firewalls and NAT, VLANs, VPNs, Proxy servers, Wireless security.  7.3. User access technologies: Wired (xDSL, FTTH), Cellular  wireless (GPRS, EDGE, HSPDA), Broadband wireless (802.16)  **Practical Works:**  • Creating VLAN |

1. **Instructional Techniques**

The instructional techniques for this course are divided into two groups. First group consists of general instructional techniques applicable to most of the units. The second group consists of specific instructional techniques applicable to particular units.

**4.1. General Techniques**

Reading materials will be provided to students in each unit. Lecture, Discussion, use of multi-media projector, brain storming are used in all units.

**4.2. Specific Instructional Techniques**

Demonstration is an essential instructional technique for all units in this course during teaching learning process. Specifically, demonstration with practical works will be specific instructional technique in this course.

The details of suggested instructional techniques are presented below:

Unit 1: Assignments on numerical related to Nyquist’s and Shannon’s theorem

Unit 2: Self-study and ask students to make presentation on examples of Terrestrial Microwaves, Satellite Communication and Cellular System.

Unit 3: Homework and Assignment on numerical related Modulation techniques

Unit 4: Homework and Assignment on Difference between OSI and TCP/IP model

Unit 5: Homework and Assignment on comparison of IP version 4 and IP version 6

Unit 6: Self-study and ask students to make detail report and presentation on IEEE 802 MAC layer standards: 802.3, 802.11, 802.15,

Unit 7: Self-study and ask students to make detail report and presentation on GPRS, EDGE, HSPDA

1. **Evaluation :**

|  |  |  |  |
| --- | --- | --- | --- |
| **Internal**  **Assessment** | **External Practical**  **Exam/Viva** | **Semester**  **Examination** | **Total**  **Marks** |
| 40 Points | 20 Points | 40 Points | 100 Points |

***Note****: Students must pass separately in internal assessment, external practical exam and semester**examination.*

**5.1. Internal Evaluation (40 Points):**

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

|  |  |
| --- | --- |
| 1. Class Attendance | 5 points |
| 1. Learning activities and class performance | 5 points |
| 1. First assignment (written assignment) | 10 points |
| 1. Second assignment (Case Study/project work with presentation ) | 10 points |
| 1. Terminal Examination | 10 Points |
| Total | 40 Points |

**5.2 Semester Examination (40 Points)**

Examination Division, Dean Office will conduct final examination at the end of semester.

|  |  |
| --- | --- |
| 1. Objective question (Multiple choice 10 questions x 1mark) | 10 points |
| 1. Subjective answer questions (6 questions x 5 marks) | 30 points |
| Total | 40 points |

**5.3 External Practical Exam/Viva (20 Points):**

Examination Division, Dean Office will conduct final practical exam at the end of semester.

1. **Recommended books and References materials (including relevant published articles in national and international journals)**

**Recommended books:**

Tanenbaum Andrew S., Computer Networks, 4th edition (2nd Impression 2006) or available latest edition

William Stallings, Data and Computer Communications, 7th Edition (3rd Impression 2007) or available latest edition

**References materials:**

Larry L. Peterson, Bruce S. Davie, Computer Networks: A Systems Approach, 4th Edition or available latest edition

Halsall Fred, Data Communications, Computer Networks and OSI, 4th edition (10th Indian reprinting 2005) or available latest edition.

**Course Title: Software Engineering & Project Management**

Course No. : ICT Ed. 457 Nature of course: Theory + Case Studies

Level: B.Ed. Credit Hour: 3 hours (3T+2T)

Semester: Fifth Teaching Hour: 80hours (48+32)

1. **Course Description**

The purpose of this course is to introduce the fundamental concepts of Software Engineering, including software Project management. At the end of this course, a student will be able to understand the fundamental concepts of software engineering and project management.

1. **General Objectives**

Through this course, students shall

* 1. To evaluate and relate different software processes, system models and architectural designs and assess their suitability in a given context
  2. To describe basic concepts and principles of requirements engineering, software implementation, testing and maintenance
  3. To describe the software configuration process and quality assurance
  4. To apply the software project manage practices and principle in software development.

1. **Course Outlines:**

|  |  |
| --- | --- |
| **Specific Objectives** | **Contents** |
| * Identify software components and their values. * Define terms related to software Engineering. * Describe different types of software process models and their usefulness. * Understand benefits of software process model | **Unit 1: Software and software engineering (8)**  1.1. Introduction to software  1.2. Evolving role of software  1.3. Program Vs software  1.4. Characteristics of software  1.5. Types of software  1.6. Generic view of software engineering  1.7. Software process and software process model.  1.8. Myth and Ethics on software engineering. |
| * Explain use and importance of software development life cycle * Describe the types of software development process * Comparison of different software process model | **Unit 2: Software development process models (8)**  2.1. Waterfall model and enhance waterfall model  2.2. Incremental process models  2.3. Rapid application development  2.4. Prototype and spiral model  2.5. Spiral process model  2.6. Rational unified process model  2.7. Agile model: XP and Scrum |
| * Discuss about Software requirement * Requirement engineering * Explain about requirement management and SRS documents | **Unit 3: Software requirement specification (8)**  3.1 Software requirement and its types  3.2 Requirement engineering  3.3 Requirement elicitation  3.4 Requirement analysis  3.5 Requirement documentation and validation  3.6 Requirement management  3.7 SRS documents |
| * Explain software project management and planning * Discuss about project estimation techniques * Understand the COCOMO model * Discuss about risk, software configuration management | **Unit IV: Software project management (20)**  4.1. Software project  4.2. Activities in project management  4.3. Software project planning  4.4. Software project management plan  4.5. Software project scheduling and techniques  4.6. Software project team management and organization  4.7. Project estimation techniques: COCOMO model  4.8. Risk analysis and management  4.9. Risk management process |
| * Understand importance of software design * Discuss about software design models * Compare and contrast between Function oriented design vs Object oriented design | **Unit 5 Software design (8)**  5.1. Design framework  5.2. Software design models  5.3. Design process  5.4. Architecture design  5.5. Low level design  5.6. Coupling and cohesion  5.7. Software design strategies  5.8. Function oriented design  5.9. Object oriented design  5.10. Function oriented design Vs Object oriented design |
| * Understand software measurement and metrics * Discuss object oriented matrices | **Unit 6: Software measurement and metrics (8)**  6.1. Software measurement  6.2. Software metrics  6.3. Control flow graph  6.4. Cyclomatic complexity  6.5. Object oriented matrices  6.6. Lossless Decomposition |
| * Understand the concept of software maintenance * •Discuss types of software maintenance * •Understand Software maintenance cost | **Unit 7: Configuration Management (8)**  7.1. Software configuration management  7.2. Software change management  7.3. Version and release management  7.4. Need for software maintenance  7.5. Types of software maintenance  7.6. Software maintenance process model  7.7. Software maintenance cost |
| * Understand the concepts of re-engineering and reverse engineering * Understand the re-engineering process model * Discuss difference between reverse, forward and re-engineering | **Unit 8: Software re-engineering (8)**  8.1. Steps in re-engineering  8.2. Re-engineering process  8.3. Software re-engineering process model  8.4. Forward engineering  8.5. Reverse engineering process  8.6. Characteristic of reverse engineering  8.7. Difference between reverse, forward and re-engineering  8.8. Software reuse |
| * Understand the concept of software testing methods and principles * Understand the concept of Software quality and assurance * Explain about maturity model | **Unit 9: Software Testing and quality assurance(4)**  9.1 Software testing principle  9.2 Software testing approach  9.3 unit, integration and system testing  9.4 Software quality attributes and Quality factors  9.5 Software Quality control and Quality assurance  9.6 Software safety  9.7 The ISO 9000 model  9.8 SEI capability maturity model  9.9 Verification and validation |

1. **Instructional Techniques**

The instructional techniques for this course are divided into two groups. First group consists of general instructional techniques applicable to most of the units. The second group consists of specific instructional techniques applicable to particular units.

**4.1 General Techniques**

Reading materials will be provided to students in each unit. Lecture, Discussion, use of multi-media projector, brain storming are used in all units.

**4.2 Specific Instructional Techniques**

Demonstration is an essential instructional technique for all units in this course during teaching learning process. Specifically, demonstration with practical works will be specific instructional technique in this course. The details of suggested instructional techniques are presented below:

Unit 1: Self reading, and making study reports

Unit 2: Comparison about different software process model.

Unit 3: Homework and Assignment on Requirement elicitation and Requirement analysis

Unit 4: Homework and Assignment on Software design models

Unit 5: Group Discussion on Software design strategies

Unit 6: Discuss on Software measurement

Unit 7: Self reading and making study reports Types of software maintenance

Unit 8: Group discuss on reverse engineering, forward process

Unit 9: Self reading, creating and presenting study reports

1. **Evaluation :**

|  |  |  |  |
| --- | --- | --- | --- |
| **Internal**  **Assessment** | **External Practical**  **Exam/Viva** | **Semester**  **Examination** | **Total**  **Marks** |
| 40 Points | 20 Points | 40 Points | 100 Points |

***Note****: Students must pass separately in internal assessment, external practical exam and semester**examination.*

**5.1. Internal Evaluation (40 Points):**

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

|  |  |
| --- | --- |
| 1. Class Attendance | 5 points |
| 1. Learning activities and class performance | 5 points |
| 1. First assignment ( written assignment) | 10 points |
| 1. Second assignment (Case Study/project work with presentation ) | 10 points |
| 1. Terminal Examination | 10 Points |
| Total | 40 Points |

**5.2 Semester Examination (40 Points)**

Examination Division, Dean Office will conduct final examination at the end of semester.

|  |  |
| --- | --- |
| 1. Objective question (Multiple choice 10 questions x 1mark) | 10 points |
| 1. Subjective answer questions (6 questions x 5 marks) | 30 points |
| Total | 40 points |

**5.3 External Practical Exam/Viva (20 Points):**

Examination Division, Dean Office will conduct final practical exam at the end of semester.

1. **Recommended books and References materials (including relevant published articles in national and international journals)**

**Recommended books:**

**References materials:**

Sommerville, I. (2011). *Software engineering* (9th ed.). Boston: Pearson.

Pressman, R. S. (2010). *Software engineering: a practitioner’s approach* (7th ed.). Boston,

Mass: McGraw Hill.

Software engineering, Udit Agarwal

Software Engineering Fundamentals, “ Ali Behforooz and Frederick J. Hudson

**Course Title: Numeric Analysis**

Course No. : Math Ed. 455 Nature of course: Theoretical

Level: B.Ed. Credit Hour: 3 hours

Semester: Fifth Teaching Hour: 48 hours

1. **Course Description**

This course is designed for the students of Bachelor level ICT in the Faculty of Education under Tribhuvan University. It helps students to fulfill their increasing desire towards numerical answers to applied problems with the help of methods and techniques of numerical analysis .Although numerical methods have always been useful, their role in the present day scientific research is of fundamental importance. It deals with numerical methods which give the solution when ordinary analytical methods fail for the solution of transcendental equations. In addition, it deals those numerical techniques which can be used for the solution of system of linear equations through matrix computations. This course also discusses for the solution of non-linear equations through interpolation and iterative method of differentiation and integration. This course also provides a foundation for the mathematical modeling in the field of research.

1. **General Objectives**
   1. To understand errors and approximation.
   2. To use different methods for solving transcendental and linear simultaneous equations.
   3. To define different types of differences and construct their tables ,and establish the relationship between them
   4. To be familiar with interpolation and apply suitable interpolation formula for numerical problems
   5. To deal with numerical approximations of derivatives
   6. To approximate computation of an integral using numerical techniques
2. **Course Outlines:**

|  |  |
| --- | --- |
| **Specific Objectives** | **Contents** |
| * To identify the types of errors * To derive general error formula * To generalize a series approximation | **Unit 1: Computations and Errors (3)**  1.1. Significant digits  1.2. Errors  1.3. General error formula  1.4. Error in a series approximation |
| * To discuss the solution of linear equations graphically * To find solution of equations by bisection method * To discuss the method of false position * To solve equations by iteration method * To derive and use Newton-Raphson iteration formula * To approximate roots of an equation by Muller’s method. | **Unit 2: Solution of Algebraic and Transcendental Equations (8)**  2.1. Linear equations  2.2. Graphical solution of equations  2.3. Bisection method  2.4. The method of false position  2.5. Iteration method  2.6. Newton – Raphson method  2.7. General Newton’s formula for multiple roots  2.8. Muller’s method |
| * To apply Gauss elimination method in solving simultaneous equations * To solve simultaneous equations by Gauss - Jordan method * To discuss Jacobi’s and Gauss –Seidel iteration method * To discuss and use factorization, iterative and partition method to solve simultaneous equations | **Unit 3: Solution of Linear Simultaneous Equations (6)**  3.1 Gauss elimination method  3.2 Gauss – Jordan method  3.3 Jacobi – Iteration method  3.4 Gauss – Seidel iteration method  3.5. Matrix inversion method  3.6 Factorization method  3.7 Iteration method  3.8 Partition method |
| * To discuss forward and backward difference operators * To construct difference tables * To discuss properties of the forward difference operator * To establish relationship among the operators E, D and D * To express a given polynomial in factorial notation | **Unit 4: Finite differences (4)**  4.1. Forward difference operator  4.2. Forward difference table  4.3. The operator E  4.4. Relation between the operator E and D  4.5. The operator D  4.6. Backward difference table  4.7. Factorial polynomial |
| * To identify the central difference and the mean operator * To construct the central difference table * To find relationship between the operators D, Ñ, E, μ and d | **Unit 5 Central differences (4)**  5.1. Central difference operator  5.2. Central difference table  5.3. Mean operator  5.4. Relationship between operators D, Ñ, E, μ and d |
| * To derive and use Newton-Gregory forward interpolation formula * To derive and use Newton-Gregory backward interpolation formula * To apply forward and backward interpolation formulae in solving problems | **Unit 6: Interpolation with Equal Intervals (5)**  6.1. Newton-Gregory forward interpolation formula  6.2. Newton-Gregory backward interpolation formula  6.3. Error in the interpolation formula |
| * To discuss linear and quadratic interpolations * To find divided differences * To establish the relationship between divided differences and ordinary differences | **Unit 7: Interpolation with Un-equal Intervals (5)**  7.1. Linear interpolation  7.2. Quadratic interpolation  7.3. Divide differences  7.4. Second divided difference  7.5. Relation between divided and ordinary differences |
| * To derive and use Gauss’ forward and backward interpolation formula * To apply Bessel’s and Stirling’s formula for interpolation | **Unit 8: Central difference Interpolation (8)**  8.1. Gauss’ forward interpolation formula  8.2. Gauss’ backward interpolation formula  8.3. Bessel’s formula  8.4. Stirling’s formula |
| * To derive formula for the derivative using forward and backward * To derive formula for derivative using central difference formula | **Unit 9: Numerical Differentiation (4)**  9.1 Numerical differentiation  9.2. Derivative using forward difference formula  9.3. Derivative using backward difference formula  9.4. Derivative using central difference formula |
| * To derive general quardrature formula * To apply trapezoidal rule, Simpson’s one-third rule, three-eight rule * To find errors in quadrature formula * To discuss on deductions from Cote’s formula | **Unit 10: Numerical Integration (5)**  10.1 General quadrature formula for equidistant ordinates  10.2 Trapezoidal rule  10.3 Simpson’s One –Third rule  10.4 Simpson’s Three – Eight rule  10.5 Bool’s rule  10.6 Weddle’s rule  10.7 Errors in quadrature formula  10.8 Newton Cote’s formula  10.9 Deductions from Cote’s formula  10.10 Double integration |

1. **Instructional Techniques**

**Units Activities and Instructional Techniques**

Unit 1: Individual and group discussion on calculating errors

Unit 2: Individual and group discussion on bisection and iteration methods

Group and individual assignment on problems of getting roots by bisection method,

Unit 3: Group and individual discussion on different methods of solving linear simultaneous equation.

Unit 4: Individual and group assignment on finite difference

Unit 5: Presentation and discussion on computer programming in c++ of important method.

Unit 6: Individual and group assignment on forward and backward interpolation formula.

Unit 7: Individual and group presentation on divided differences and ordinary differences.

Unit 8: Individual and group assignment to solve problems related to central difference interpolation.

Unit 9: Discussion on numerical differentiation.

Unit 10: Group work on numerical integration.

The instructional techniques for this course are divided into two groups. First group consists of general instructional techniques applicable to most of the units. The second group consists of specific instructional techniques applicable to particular units.

1. **Evaluation :**

**5.1. Internal Evaluation (40 Points):**

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

|  |  |
| --- | --- |
| 1. Class Attendance | 5 points |
| 1. Learning activities and class performance | 5 points |
| 1. First assignment ( written assignment) | 10 points |
| 1. Second assignment (Case Study/project work with presentation ) | 10 points |
| 1. Terminal Examination | 10 Points |
| Total | 40 Points |

**5.2 Semester Examination (40 Points)**

Examination Division, Dean Office will conduct final examination at the end of semester.

|  |  |
| --- | --- |
| 1. Objective question (Multiple choice 10 questions x 1mark) | 10 points |
| 1. Short answer questions (6 questions x 5 marks) 2. Long answer questions (2 questions x 10 marks) | 30 points  20 points |
| Total | 60 points |

1. **Recommended books and References materials (including relevant published articles in national and international journals)**

**Recommended books:**

Sastry, S.S. (1990). *Introductory methods of numerical analysis* ,New Delhi :

Prentice- Hall of India ( Units I – X )

Gupta S. and Sharma S.(2014).*Numerical analysis* ,New Delhi :

S.K .Kataria & Sons ( Units I – X )

**References materials:**

Conte S.D. (1965) , *Elementary numerical analysis* Mc Graw- Hill Froberge

C.E. (1965) , *Introduction to numerical analysis ,*Adison Wesley

Jian , M.K.(1971) , *Numerical analysis for scientists and engineers* Delhi:S.B.W . Publishers

Sastry S.S. (1997) , *Engineering mathematics* , New Delhi : Prentice-Hall of India

Stanton, R.G. (1967), *Numerical methods for science and engineering*, New Delhi : Prentice-Hall of India