Purbanchal University
Bachelor in Information Technology (BIT)

Year: IV   **Semester: VII**

S.N	Course Code	Course description	Credits	Lecture (Hrs)	Tutorial (Hrs)	Practical (Hrs)	Total (Hrs)
1	BIT472CO	Artificial Intelligence	3	3	1	2	6
2	BIT474CO	Network Programming	3	3	1	2	6
3	BIT475CO	Software Engineering	3	3	1	-	4
4	BIT476CO	MIS	3	3	1	-	4
5	BIT379CO	Elective I	3	3	1	2	6
6	BIT478CO	Project - VII	3	-	1	3	4
		Total	**18**				

List of electives I

1. GIS BIT477GI
2. Multimedia System BIT477MS
3. Cloud Computing BIT477CC
4. Distributed Processing BIT477DP
5. Theory of Computation BIT477TC
6. Internet and Intranet BIT477II
7. Simulation and Modeling BIT477SM

Artificial Intelligence
BIT472CO

Year: IV   **Semester: VII**

Teaching Schedule Hours/Week			Examination Scheme				
Theory	Tutorial	Practical	Internal Assessment		Final		Total
3	1	2	Theory	Practical	Theory	Practical	150
			20	50	80	-	

Course objective

The objective of this course is to provide basic knowledge of AI, machine learning, natural language, expert system and neural network.

Contents

1. **Introduction**   **[3 Hrs]**
   1.1 Definitions and goals in AI
   1.2 History and challenges of AI
   1.3 Applications of AI

2. **Agents**   **[3 Hrs]**
   2.1 Introduction to agents and agent programs
   2.2 Types of agent programs
   2.3 Properties and types of agent environment, PEAS

3. **Problem solving**   **[9 Hrs]**
   3.1 Planning and its types
   3.2 Problem and its types
   3.3 Searching and its types
   3.4 Uniformed search algorithms (breadth-first, depth-first, depth-limited search, iterative-deepening, uniform-cost, bi-directional search)
   3.5 Informed search algorithms (best-first, A* search)
   3.6 Means-ends analysis
   3.7 Forward chaining and backward chaining
   3.8 Game playing
   3.9 Constraint satisfaction problem and crypt-arithmetic puzzles

4. **Knowledge representation**   **[10 Hrs]**
   4.1 Knowledge and its types
   4.2 Logic, semantic nets, frames
   4.3 Propositional logic
   4.4 Predicate logic
   4.5 Clausal form, resolution

5. **Reasoning** [4 Hrs]

   5.1 Inference theorems

   5.2 Monotonic and non-monotonic reasoning

   5.3 Probabilistic reasoning, Bayesian network

   5.4 Case-based reasoning

   5.5 Uncertainty in reasoning

6. **Learning** [4 Hrs]

   6.1 Concepts and types of learning

   6.2 Rote learning, learning by analogy, inductive learning

   6.3 Explanation based learning

   6.4 Supervised and unsupervised learning

   6.5 Genetic algorithm

7. **Neural network** [4 Hrs]

   7.1 Introduction to artificial neural network

   7.2 Network structure

   7.3 Back propagation

   7.4 Hopfield network, Boltzmann machines

8. **Expert system** [4 Hrs]

   8.1 Structure of expert system

   8.2 Knowledge acquisition, knowledge elicitation

   8.3 Applications and development of expert system

   8.4 Examples of expert systems- DENDRAL, MYCIN, etc

9. **Natural language processing** [4 Hrs]

   9.1 Concepts of natural language understanding and natural language generation

   9.2 Steps in natural language processing

   9.3 Parse tree representation in natural language

Laboratories

Students must do lab works on prolog or LISP to cover the following topics:

- Using Prolog or LISP to understand variables, functions, rules, input-output, arithmetic operations, recursion

- Solving family relation problems, GCD problem, Tower of Hanoi

Reference books

- E. Rich & K. Knight, "*Artificial Intelligence*", McGraw Hill

- E. Turban, "*Decision Support Systems & Expert Systems*", Macmillan

- P. H. Winston, "*Artificial Intelligence*", Addison Wesley

- D. Crookes, "*Introduction to Programming in Prolog*", Prentice Hall
- Stuart Russel & Peter Norvig, "*Artificial Intelligence*", Pearson Edition
- R. Singhal, "*Formal Concepts in Artificial Intelligence*", Chapman & Hall

Network Programming
BIT474CO

Year: IV   **Semester: VII**

Teaching Schedule Hours/Week			Examination Scheme				
Theory	Tutorial	Practical	Internal Assessment		Final		Total
3	1	2	Theory	Practical	Theory	Practical	150
			20	50	80	-	

Course objective

At the end of this course, students will be able to design and implement network client server applications.

Contents

1. **Introduction to network programming**   **[5 Hrs]**
   Introduction to computer network: client/ server model, Protocol Suite (ISO/OSI, TCP/IP), Unix Standards (POSIX, Open Group, IETF), Network Utilities (telnet, route, ipconfig, ifconfig, ping, netstat, And ftp) Introduction to programming: wrapper functions, header files, libraries and ports numbers, IP address. Iterative server, concurrent server, networked servers

2. **Elementary operating system calls**   **[6 Hrs]**
   System call, program, thread, process, Kernel, fork(), exec() and its family, waitpid(), wait(), pipe(), Fifo(), signals (SIGCHLD, SIGINT, SIGIO). IPC Names, creating and opening IPC channels, IPC names, creating and opening IPC channels, IPC permissions

3. **TCP/UDP transport layer protocols**   **[4 Hrs]**
   TCP (Transmission Control Protocol): features, connection establishment and termination, states in communication (LISTEN, TIME_WAIT, ESTABLISHED, BLOCKED) UDP (user datagram protocol): features, uses, comparison with TCP. TCP and UDP buffer sizes and limitations. SCTP

4. **Elementary socket calls**   **[5 Hrs]**
   Socket address structure: for IPV4, IPV6, UNIX domain socket and generic socket address structure, value-result argument. Byte ordering and manipulating function: htonl( ), htons(), ntohl(), ntohs(), inet_addr(), inet_aton(), inet_ntoa(), inet_pton()

5. **Elementary TCP-UDP socket**   **[6 Hrs]**
   Socket(), connect(), bind(), listen(), accept(), read(), write(), close(), sendto(), recvfrom(),

6. **I/O multiplexing**   **[4 Hrs]**

Introduction, I/O models: blocking I/O, non-blocking I/O, I/O multiplexing, signal driven I/O (SIGIO) and asynchronous I/O model. Select(), poll(), shutdown()

7. Socket options [2 Hrs]
Getsockopt() and setsockopt() functions, IPV4, IPV6, TCP socket options

8. Name and address conversion [2 Hrs]
Domain name system, gethostbyname(), gethostbyaddr(), uname(), getservbyname() and getservbyport(), gethostname() functions, socket timeouts

9. Unix domain protocol [3 Hrs]
Introduction, Unix domain socket address structure, socket pair function, Unix domain stream client-server, UNIX domain datagram client/server

10. Daemon processes, Inetd super servers [2 Hrs]
Introduction, Sysloged (syslog function), daemon_init function, inetd daemon

11. Broadcast and multicast [3 Hrs]
Introduction, Broadcast and multicast addresses, comparison between broadcast, unicast and multicast socket options, Unicast versus Broadcast, multicasat versus broadcast on LAN

12. IP layers and raw socket [3 Hrs]
Introduction, raw socket creation, input and output (ping example)

Lab exercise
There shall be lab strictly using c/c++/Java/Linux
- Linux commands
- IPC (Pipe(), Fifo(), Message Queue)
- TCP, UDP and Unix Domain socket client server program
- TCP echo server and client program
- Fork() System call
- Wait() and waitpid() system call
- Uname(), gethostbyaddr(), gethostbyname(), gethostname() system call
- Shell programming

Reference books
- Stevens W. R., "*Unix Network Programming*", Vol-1
- Stevens W. R., "*Unix Network Programming*", Vol-II
- Doglous E. Comer, "*Internetworking with TCP/IP*", Vol-III

Software Engineering
BIT475CO

Year: IV   **Semester: VII**

Teaching Schedule Hours/Week			Examination Scheme				
Theory	Tutorial	Practical	Internal Assessment		Final		Total
3	1	-	Theory	Practical	Theory	Practical	100
			20	-	80	-	

Course objective

This course is intended to provide an introduction to SE concepts and practices focusing on industrial software development characteristics and processes, development models and the software life cycle for mid-scale system. It provides students a comprehensive introduction to software engineering, kinds of activities that are necessary for developing a software system and important phases of software development.

Contents

1. **Introduction to software engineering** [4 Hrs]

   Definition of software engineering, the evolving role of software, changing nature of software, characteristics of software, a generic view of software engineering, software engineering-layered technology

2. **Process models** [6 Hrs]

   The waterfall model, prototyping model, RAD model, Spiral model

3. **Software project management** [7 Hrs]

   Meaning people, product, process, project in software project management, activities of project planning, project estimation techniques, COCOMO, risk management, project scheduling, staffing

4. **Software requirements and specification** [6 Hrs]

   Functional and non-functional requirements, requirements engineering process (feasibility studies, requirements elicitation and analysis, requirements validation, requirements management), data modeling and flow diagram, software prototyping techniques, requirement definition and specification

5. **Software design** [8 Hrs]

   Introduction to software design, good software designs, design principle, design concepts, design strategy, design process and design quality, software architecture and its types

6. **Software testing**   **[7 Hrs]**

    Software testing process, principle of testing, test case design, black-box testing (boundary value analysis, equivalence class portioning) white-box testing (statement coverage, path coverage, cyclomatic complexity) software verification and validation

7. **Metrics for process and products**   **[5 Hrs]**

    Software measurement, metrics for software quality, software quality assurance, software reliability, The ISO9000 quality standards

8. **Object oriented software engineering**   **[2 Hrs]**

    Concepts, modeling with UML

Reference books

- *Software Engineering*, A Practitioner's Approach Roger S. Pressman, 6th edition. McGraw Hill International edition
- *Software Engineering*, Sommerville, 7th edition, Pearson education, 2004

Management Information System
BIT476CO

Year: IV   **Semester: VII**

Teaching Schedule Hours/Week			Examination Scheme				
Theory	Tutorial	Practical	Internal Assessment		Final		Total
3	1	-	Theory	Practical	Theory	Practical	100
			20	-	80	-	

Course objective

This subject aims at equipping students the knowledge of management information system and other different types of business oriented computer information systems. The course provides students with an introduction to information systems (IS) and information technology (IT) and their use in an increasingly competitive business world.

Contents

1. **Introduction to information system**   **[3 Hrs]**
   Information system verses information technology, computer literacy verses information literacy, data verses information, need of MIS for students and organization

2. **Information system for managerial decision making**   **[5 Hrs]**
   Transaction processing system, steps in processing a transaction, management information system, ISS, DSS, EIS, AI and ES, OAS, tapping the potential of information system

3. **DSS and EIS**   **[6 Hrs]**
   Application of DSS, components of a DSS, functions DSS, GDSS, EIS, characteristics of an EIS, critical success factor of DSS/EIS

4. **ES and neural networks**   **[5 Hrs]**
   Appropriate areas for an ES, application of ES, components of ES, knowledge representation, neural networks

5. **Office automation**   **[3 Hrs]**
   The virtual corporation, types of OAS, importance of OAS in organizations, communication system

6. **Business information system**   **[6 Hrs]**
   Functional information system, manufacturing information system, quality information system, financial and accounting information system, developing cross-functional system

7. **Strategic information system** **[4 Hrs]**

   Definition of strategic information system, characteristic of strategic information system, strategies for developing an SIS, potential barriers to developing an SIS, case studies in SIS

8. **Managing information resources** **[5 Hrs]**

   Definition of IRM, principle of managing information resources, objectives of IRM, IRM function and case studies

9. **Computer security** **[4 Hrs]**

   Definition of computer security, security control and disaster recovery plans, developing a disaster recovery plan

10. **Recent technologies in MIS** **[2 Hrs]**

    Commerce (E-business, E-learning, E-governances, E-medicine, virtual reality), internet and communication technologies

11. **Cyber law** **[2 Hrs]**

    Introduction to cyber law of Nepal, background, cyber crime (meaning and nature, types of cyber crime, role of computer and computer networks), cyber ethics

Reference books

- UMA G. Gupta, "*Management Information System, A managerial* Perspective", Galgotia publication Pvt. Ltd.
- Larry Long, "*Management Information System*", PHI

Project – VII
BIT 478 CO

Full marks: 100
Internal: 40
Final: 60

Course objectives
After finishing this project, student will be able to develop professional application.

Course content
- There should be total of 45 hours covering important feature of software engineering practices, RDBMS and any object oriented programming.
- The application project will be assigned in a group of two/three students.
- An interested topic will be collected and instructed to each group.
- Students must develop the assigned application, submit written report and give oral presentation

Project evaluation criteria
The internal practical marks allotted for the project should be based on the following criteria:
- Mid-term presentation – 10 marks
- Pre-final submission and presentation – 20 marks
- Final presentation – 10 marks

The external marks should be given based on the following criteria:
- Presentation – 10 marks
- Project – 20 marks
- Documentation – 20 marks
- Viva – 10 marks