UNIVERSITY OF SARGODHA
SARGODHA

Registrar's Office
Phone: 048-9230811-15 Ext: (517)

No.UOS/Acad/895
Dated: 27-/11/2013

29 NOV 2013

The Chairman/Convener
Board of Studies in Computer Science
University of Sargodha

Subject: **MINUTES OF THE MEETING OF BOARD OF STUDIES IN COMPUTER SCIENCE HELD ON 10.09.2013**

Dear Sir,

I am directed to refer to the minutes of meeting of Board of Studies in Computer Science held on 10.09.2013 and inform that the minutes were submitted to the Vice-Chancellor for perusal. Status of the various agenda items is as under:-

Item No.1 To discuss the anomalies of the approved curricula of BS(IT), BS(CS), BS(SE), M.Sc (IT) & MS(CS)

The Vice-Chancellor has been pleased to approve the anomalies as recommended by the Board of Studies in the approved curricula of BS(IT), BS(CS), BS(SE), M.Sc (IT) & MS(CS) and allow to attach (annexure-'A' to 'D') with the existing document notified vide letter No.UOS/Acad/2310 dated 06.8.2010.

C.W Item 1 Approval of the research topics of Ms. Madiha Anwar (MSCS-S12E12)

The case has been decided in 3/2013 meeting of Advanced Studies & Research Board held on 22.11.2013. Decision will be communicated later on.

C.W Item No.2 Change of Research Topics of MS Student

The case has been decided in 3/2013 meeting of Advanced Studies & Research Board held on 22.11.2013. Decision will be communicated later on.

C.W Item No.3 Elective Courses for MS program

The Vice-Chancellor has, in exercise of the powers vested in him under section 13(3) of University of Sargodha Ordinance 2002, on behalf of relevant bodies, been pleased to approve the following three courses (annexure-'E') for inclusion in the existing curriculum of MS program notified vide No.UOS/Acad/2310 dated 06.08.2010 as recommended by the Board of Studies:-

i) CMP-770 Soft Computing
ii) CMP-771 Expert Systems
iii) CMP-772 Machine Learning

Yours faithfully

(Ch. FAROOQ AHMAD)
Assistant Registrar
for Registrar

Encl: As above

C.c
Controller of Examinations

Annex-A2

Revised Curriculum of BS Software Engineering for Main Campus, Sub Campuses, and Affiliated Colleges

Department of Computer Science & Information Technology

University of Sargodha

(Applicable from Fall 2013)

Table of Contents

Guidelines for Affiliated Colleges

- BSSE program shall be offered under Term System observing University of Sargodha's Affiliation Rules & Regulation.
- There shall be two terms in a calendar academic year.
- The affiliated college(s)/institutions shall follow the prescribed curriculum and course matrix. Necessary modification/changes shall be communicated to the affiliated Colleges/Institutions, if any.
- For domain elective courses, the affiliated institution(s)/college(s) shall follow "Regular Track". However, the administration of any affiliated institution must get prior permission from the competent authority to offer any specialization tracks which are being offered in the main campus. For this purpose, the institution's administration needs to show/demonstrate the availability of appropriate human resource along with necessary educational provisions before the start of the term in which specialization track shall be offered. The recommendations of the Convener BOS shall be solicited to make the recommendations for the Institution to offer the requested specialization track already approved by the BOS. The competent authority shall give the final approval.

Curriculum

for

BS (Software Engineering) Program

The Discipline of Software Engineering

Software Engineering is a bridge connecting the basic concepts and principles of Computer Science with the variety of users who can benefit from technologies based upon those principles. It includes the design and development of software systems which are effective, efficient, robust, maintainable, and maximally useful and usable. It also includes the design and development of techniques, processes and higher level tools by which these applications can be developed in a timely, cost effective and sustainable manner. At both levels it requires a systematic approach which deals with quantifiable measures of quality and effectiveness, as well as attention to the critical nature of the various products of the process.

Software engineering therefore requires familiarity with the basic needs and processes in the various application domains, with the principles of good engineering practice and with the underlying concepts and principles of computer science. It requires facility in problem analysis, solution design, program development and documentation. It also requires a basic understanding of the ways in which humans interact with technological systems.

A software engineering program should develop professionals who have a mastery of software development principles, theory, practice, and process.

Software Engineering and Computer Science differ in much the same way as do Electrical Engineering and Physics[1]. Generally, engineering should be concerned with applying what we already know to create products, while science is more theoretical. Therefore, the goal of Computer Science, according to Parnas[2], is to *learn* and to extend the science. SE on the other hand aims to use the science and technology already available to create products and tools for use.

Software Engineering derives its essence from computer science as other engineering disciplines do from natural or life sciences, with an emphasis on issues of process, design, measurement, analysis and verification providing a strong foundation in engineering principles and practices as applied to software development.

[1] David Parnas, "Software Engineering Programmes are not Computer Science Programmes", *IEEE Software, Nov/Dec. 1999, pp. 19-30.*

[2] David Parnas, "Software Engineering Programmes are not Computer Science Programmes", *IEEE Software, Nov/Dec. 1999, pp. 19-30.*

Definition

Software Engineering is a discipline concerned with the development of software systems by applying engineering principles with the goal of developing cost-effective quality systems. There are many definitions in literature. Such as:

- "The establishment and use of sound engineering principles (methods) in order to obtain economically software that is reliable and works on real machines" [Bauer 1972].
- "Software engineering is that form of engineering that applies the principles of computer science and mathematics to achieving cost-effective solutions to software problems." [CMU/SEI-90-TR-003]
- "The application of a systematic, disciplined, quantifiable approach to the development, operation, and maintenance of software" [IEEE 1990].

Software Engineering could also be defined as:

"The application of systematic, disciplined, quantifiable approach to design, development, deployment, and maintenance of reliable and economical software systems."

Vision of Software Engineering Education

Software engineering is the discipline of creating high-quality software systems in a systematic, controlled and efficient manner. It involves the application of engineering concepts, techniques, and methods to the design, development, deployment and maintenance of software systems. A software engineering program should develop professionals who have a mastery of principles, theory, practices, and processes necessary to produce quality software systems. The curriculum committee formalized the Vision Statement for SE education in Pakistan as follows:

> "The SE education in Pakistan will focus on imparting the knowledge and training which should enable students to harmonize theory with practice, concept with application, and problem with solution. It will prepare them to apply ably engineering principles, practices, and processes to design, develop, deploy, and maintain software systems. The program will lead to development of student's professional and interpersonal skills. It will help students to enhance their ability in oral and written communication, and their adaptability to team environments. The program will inculcate among students a strong sense of civic, professional and ethical responsibility. The program will also strive to develop a capacity for innovation and a passion for lifelong learning."

SE curricula thus developed would reflect the aim to satisfy professional demands of the industry and academia both in terms of immediate needs and the capacity for longer term development. The graduates thus produced will be adequately equipped to exploit the opportunities and answer the challenges offered by the modern world.

Knowledge Areas of SE Curriculum DevelopmentABET Engineering Criteria 2000 notes:

> "The curriculum must provide both breadth and depth across the range of engineering and computer science topics implied by the title and objective of the program. The program must demonstrate that graduates have: the ability to analyze, design, verify, validate, implement, apply, and maintain software systems; the ability to appropriately apply discrete mathematics, probability and statistics, and relevant topics in computer and management sciences to complex software systems."

SE curriculum has been developed systematically by identifying the major knowledge areas of SE education, in the spirit of engineering criteria above. It is noted that efforts carried out by ACM and IEEE-CS to develop international software curricula are very relevant and provide excellent guidelines on the issue. Outcome of these efforts is documented in *Software Engineering Body of Knowledge* (SWEBOK)[3], Software Engineering Education Knowledge (SEEK)[4], and Computing Curriculum 2008[5].

The following major areas of relevant pedagogy have been identified to be appropriate for design of the software engineering curriculum:

1. Computing Foundation (CS/SE/CE)
2. Software Engineering (SE Major)
3. Software Engineering Application Domain
4. Supporting Areas (Mathematics and Natural Sciences)
5. General Education (Management, Humanities, Social Sciences)

The revised curriculum focuses on building a solid foundation in the early stages of learning. It gradually introduces and strengthens the core professional competencies and desired skill-sets. Software engineering concepts have been taken up as early as the start of 2nd year. The main technical SE contentsare covered in the third and fourth years. Practical component should use medium to large scale projects to develop in students a systematic approach to problem solving and program development.

Software Engineering Programs'Rationale

The 21st century is loaded with a large number of challenges. These challenges include globalized business environment, keeping pace with innovative technologies, the availability of information with respect to time, speed, volume, mode, nature and management of this exponentially growing information, keeping control on international and inter-organizational business processes in real time, optimization of business processes across multiple sites, highly uncertain and chaotic business environments, a new level of national & international competition

[3] *Guide to Software Engineering Body of Knowledge,* 2004 Edition,.
[4] *Software Engineering – Curriculum Guidelines for Undergraduate Degree Programs in Software Engineering, 2004August 23, 2004*
[5] Computing Curriculum 2008—Draft

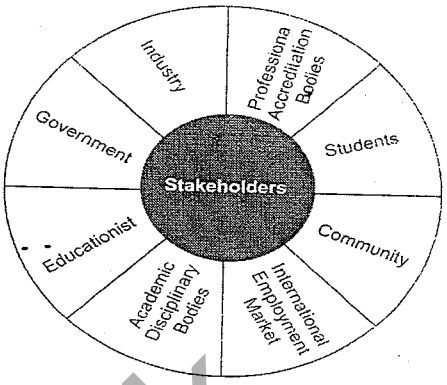
(hyper-competition), social & cultural diversity, rapidly changing products and processes, government regulations, increasing importance of skills, qualities, productivity and other stresses. To face these challenges and to bring a high level of agility, control and transparency organizations now increasingly focus on maximizing their existing technology and human infrastructure through automating various processes that can free human resource to add value elsewhere within the organization. Accordingly, the software industry looks for graduates who are not only equipped with conventional computing skills but also have the capability to develop complex software that can provide verifiable insight into underlying business processes.

Software Engineering is the discipline of developing and maintaining software systems that behave reliably and efficiently, are affordable to develop and maintain, and satisfy all the requirements that customers have defined for them. Software engineering is different in character from other engineering disciplines due to both the intangible nature of software and the related operations. It seeks to integrate the principles of mathematics and computer science with the engineering practices developed for tangible, physical artifacts. Software engineering students learn more about software reliability and maintenance and focus more on developing and maintaining software techniques while Computer Science students just acquire abstract knowledge of these aspects.

Software Engineering is a bridge connecting the basic concepts and principles of Computer Science with a variety of users who can benefit from technologies based upon those principles. It includes the design and development of software systems which are effective, efficient, robust, maintainable, and maximally useful and usable. It also includes the design and development of techniques, processes and higher level tools by which these applications can be developed in a timely, cost effective and sustainable manner. At both levels, it requires a systematic approach which deals with quantifiable measures of quality and effectiveness, as well as attention to the critical nature of various products of the process. Software Engineering, therefore, requires familiarity with the basic needs and processes in the various application domains, with the principles of good engineering practices and with the underlying concepts and principles of computer science. It requires facility in problem analysis, solution design, program development and documentation. It also requires a basic understanding of ways in which humans interact with technological systems and necessary skills to create high-quality software systems in a systematic, controlled and efficient manner. It involves the application of engineering concepts, techniques, and methods to the design, development, deployment and maintenance of software systems.

The key rationale behind BS Software Engineering program is to produce graduates who have masteryinthe above discussed aspects. The program intends to impart knowledge and training which enable students to harmonize a theory with practice, a concept with an application, and a problem with a solution. It will prepare them to apply ably engineering principles, practices, and processes to design, develop, deploy, and maintain software systems. The program will lead to development of students' professional and interpersonal skills. It will help them to enhance their ability in oral and written communication, and their adaptability to team environments. The program will inculcate among students a strong sense of civic, professional and ethical responsibility. The program will also strive to develop a capacity for innovation and a passion for lifelong learning.

Software Engineering Programs' Curriculum Underlying Principles



Curriculum plays an important role within education as it outlines the planned and structured learning experiences that an academic program provides. For an effective academic program the curriculum must meet the needs of the stakeholders and face the emerging challenges. The Department of CS & IT (UOS) realizes the rapidly changing needs of today's knowledge intensive technology driven complex work places and the changing patterns of 21st century universities' education which have removed the identity of place, the identity of time, the identity of the scholarly community, and the identity of the student community. To meet these challenges, the Department has revised the existing curriculum. The revised curriculum is based on following underlying principles:

i. The curriculum should be a broad based and provides students with the flexibility to work across many disciplines & professions.
ii. The curriculum should prepare graduates to succeed in a rapidly changing field.
iii. The curriculum should provide guidance for the expected level of mastery of topics by graduates.
iv. Should provide realistic, adoptable recommendations that provide guidance and flexibility, allowing curricular designs that are innovative and track recent developments in the field.
v. The curriculum contents should be relevant and compatible with a variety of institutions.
vi. The size of the essential knowledge must be managed.
vii. The curriculum should identify the fundamental skills and knowledge that all graduates should possess.
viii. The curriculum should provide the greatest flexibility in organizing topics into courses and curricula.

In the light of these principles, the curriculum of the program has adopted a balanced and multidisciplinary approach and presents a blend of study areas which spread across the boundaries of fundamental knowledge of traditional disciplines to advanced knowledge of the emerging disciplines. Body of knowledge (BOK) of the program covers knowledge areas which are required for the program's accreditation from the Accreditation Council and knowledge area which are required for professional certification and professional development.

It is universally accepted that each profession needs both a specific skill set and an appropriate mindset. Developing an appropriate mindset of the prospective computing graduates requires a body of knowledge which enriches students' experiences, thoughts, beliefs, assumptions, and attitudes about the special characteristics of that specific domain. Therefore, the course contents and related practical experiences are designed to meet the professional requirements of the respective domain. For this purpose, the curriculum has focused on following six (6) key areas:

i. Knowledge: Theoretical learning of concepts and principles regarding a particular subject(s).

ii. Skills: Capability of using learnt knowledge and applying it according to the context
iii. Competencies: The ability to do things satisfactory- not necessarily outstandingly or even well, but rather to a minimum level of acceptable performance.
iv. Expertise: Level of proficiency and innovative ways of applying learnt knowledge. (Competitive edge)
v. Dispositions: Habits of mind or tendencies to respond to certain situations in certain ways. The role of dispositions in computing education is very important. For example, having the disposition to be a programmer is much better that just having programming skills.
vi. Values: Moral, ethical and professional practices.

To make curriculum more effective, specialization tracks have also been integrated within the curriculum. These specialization tracks are designed according to what the industry is looking for in an employee and the learning interests of students. Furthermore, life skills including desired dispositions, soft skills, public speaking, critical thinking & reasoning, 21st Century literacies, personal attributes, entrepreneurship, attitude towards lifelong learning, professional practices and other social skills have not considered discrete items, rather threaded into the entire fabric of the curriculum.

BS Software Engineering Program'sAims & Objectives

BSSE Program aims to create, expand, disseminate and teach the Software Engineering body of knowledge through academics, applications and research which positively impact society locally, nationally, and internationally.

The objective of the program is to prepare students for professional careers and graduate studies with a balance between computing theory and practical application of software engineering concepts, methodologies, tools and technologies in the modern software development environments.The curriculum is designed to ensure breadth across allied disciplines and supporting subjects; and depth in most areas of the software engineering body of knowledge. Various components have been included in the curriculum to ensure that the graduates will:

- Understand and be able to apply mathematics, physical science, computer science and related disciplines.
- Understand and be able to apply the principles of software engineering practices and processes, subject to realistic constraints.
- Be able to model, analyze, document and track system requirements, both functional and non-functional.
- Be able to design, implement, deploy and maintain quality oriented software systems.
- Be able to verify and validate quality oriented software systems.
- Have an awareness of current industry standards and practices.
- Be able to work in one or more application domains.
- Understand and apply the principles of software quality assurance.
- Be able to understand and apply software project management skills: measurement, estimation, costing, planning, documenting, deployment and tracking of resources.
- Have strong communication, team management and interpersonal skills.
- Be capable of independent learning.

- Understand professional responsibility and application of ethical principles.
- Have knowledge of economics, humanities and social sciences.

BSSE Program's Outcome

The program will produce entrepreneurs of great character, competence, vision and driveequipped with up-to-date knowledge, marketable skills, valuable competencies, unique expertise, globally compatible dispositions and culturally and professionally acceptable values to take on appropriate professional roles in computer science domain or proceed to further or higher education or training.

BSSE Program's Structure

The structure of a BS program in Software Engineering meets the needs of students with formal computing experience and with established relevant skills. The students are expected to learn theoretical and practical understanding of the entire field of Software Engineering. The program structure provides basis for various options including Breadth-Based, Depth-Based, and Integrated Breadth & Depth-Based specializations. Student may choose a particular option, which is the most appropriate to their planned future career. Followings are the program's details:

Specializations

Students can opt one of the following specialization track:

1. Regular Track
2. Web Engineering
3. Database Management Systems

Degree Requirement

Minimum credit hours shall be 138 for BS (Software Engineering) program including computing related courses.

Duration

The program shall comprise Eight (8) semesters/terms spread over Four (4) calendar yearswith two semesters/terms a year. University rules and regulations shall determine the maximum time-limit of the Degree.

Eligibility Criteria

The candidates must have intermediate with mathematics/computer science or equivalent qualification with at least 2nd division or equivalent.

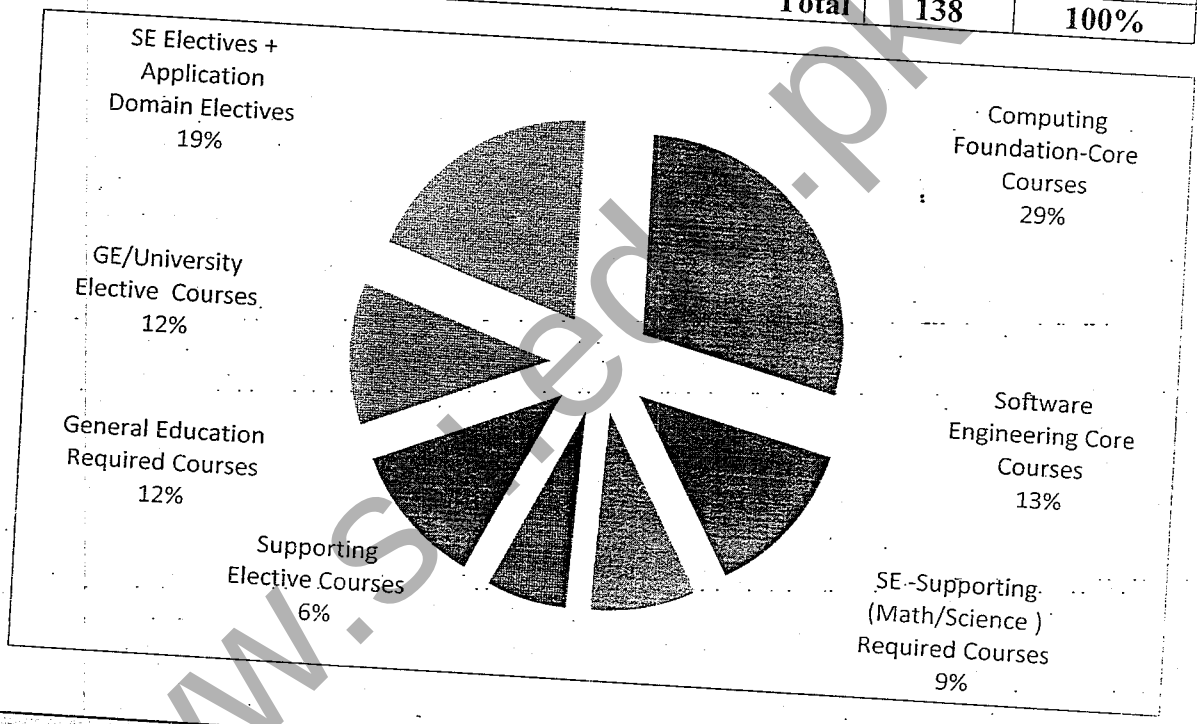
Assessment & Evaluation

University's Semester and Examination Rules &Regulations shall be followed for assessment & evaluation.

Distribution of Courses

Followings are the distribution of total credit hours:

Major Areas	Cr. Hrs.	%
Computing Foundation-Core Courses	40	29%
Software Engineering Core Courses	18	13%
SE -Supporting (Math/Science) Required Courses	12	9%
SE-Supporting Elective Courses	9	7%
General Education Required Courses	20	14%
GE/University Elective Courses	12	8%
SE Electives+ Application Domain Electives	27	20%
Total	**138**	**100%**



Computing Core Courses – 40 Credit Hours				
#	Code	Pre-Req	Course Title	Cr. Hrs.
1	CMP-2122	-	Programming Fundamentals	4 (3+1)
2	CMP-2123	CMP-2122	Object Oriented Programming	4 (3+1)
3	CMP-2111	-	Discrete Structures	3 (3+0)
4	CMP-3112	CMP-2123	Data Structure and Algorithms	3 (3+0)
5	CMP-2210	-	Digital Logic Design	3 (3+0)
6	CMP-3621	-	Operating Systems	4 (3+1)
7	CMP-3450	-	Database Systems	4 (3+1)
8	CMP-3310	-	Software Engineering	3 (3+0)

9	CMP-2540	-	Computer Communication and Networks	3 (3+0)
10	CMP-3711	-	Human Computer Interaction	3 (3+0)
11	CMP-4970	-	Capstone Project	6 (0+6)

Software Engineering Core Courses – 18 Credit Hours				
#	Code	Pre-Req	Course Title	Cr. Hrs.
12	SE-3342	CMP-3310	Software Requirement Engineering	3(3+0)
13	SE-3344	CMP-2122	Software Construction	3(3+0)
14	SE-3341	CMP-3310	Software Testing and Quality Engineering	3(3+0)
15	SE-4343	SE-3342	Software Design & Architecture	3(3+0)
16	SE-4349	CMP-3310	Software Project Management	3(3+0)
17	SE-4340	-	Formal Methods in Software Engineering	3(3+0)

General Education Courses – 20 Credit Hours				
#	Code	Pre-Req	Course Title	Cr. Hrs.
18	ENG-2411	-	Functional English (English-I)	3 (3+0)
19	ENG-2412	-	Communication Skills (English-II)	3 (3+0)
20	ENG-2413	-	Technical and Report Writing (English-III)	3 (3+0)
21	SS-2311	-	Islamic Studies	2 (2+0)
22	SS-2312	-	Pakistan Studies	2 (2+0)
23	ICT-2021	-	Introduction to Information & Communication Technologies	4 (3+1)
24	SS-4910	-	Professional Practices	3 (3+0)

SE -Supporting (Math/Science) Required Elective Courses - 12 Credit Hours				
#	Code	Pre-Req	Course Title	Cr. Hrs.
25	MATH-2213	-	Calculus and Analytical Geometry	3(3+0)
26	MATH-2110	-	Probability and Statistics	3(3+0)
27	MATH-3215	-	Linear Algebra	3(3+0)
28	PHY-2210	-	Basic Electronics	3(3+0)

Supporting Elective Courses - 9 Credit Hours				
#	Code	Pre-Req	Course Title	Cr. Hrs.
29	SE-3311	CMP-2123	Object Oriented Analysis and Design	3(3+0)
30	SE-4342	CMP-3310	Software Engineering Economics	3(3+0)

31	CS-3548	CMP-2122	Web Systems and Technologies	3(3+0)

GE/University Elective Courses - 12 Credit Hours				
#	Code	Pre-Req	Course Title	Cr. Hrs.
32	MNG-2212	-	Principles of Management	3(3+0)
33	MNG-2215	-	Human Resource Management	3(3+0)
34	MNG-2217	-	Organizational Behaviour	3(3+0)
35	SS-2410	-	Principles of Psychology	3(3+0)
36	SS-2511	-	Principles of Philosophy	3(3+0)
37	MNG-2210	-	Financial Accounting	3(3+0)
38	MNG-3262		Entrepreneurship	3(3+0)
39	SS-2XXX	-	Foreign/Regional Language (Foreign/Regional Language (French, German, Sindhi, Punjabi etc.)	3(3+0)

Software Engineering Elective Courses - 27 Credit Hours

Regular Track Elective Courses - 27 Credit Hours (Any 9 Courses)				
40	SE-4349	SE-4345	Model-Driven Software Development	3(3+0)
41	SE-4345	CMP-3310	Design Patterns	3(3+0)
42	SE-4344	CMP-3310	Software CASE Tools & Applications	3(3+0)
43	CS-4746	CMP-3310	E-Commerce Applications Development	3(3+0)
44	CS-4461	CMP-3450	Enterprise Resource Planning Systems	3(3+0)
45	CS-4547	CMP-2123	Mobile Application Development	3(3+0)
46	CS-4744	CS-3548	Enterprise Application Development	3(3+0)
47	CS-3811	CMP-2111	Artificial Intelligence	3 (3+0)
48	CS-4544	CMP-3621	Cloud Computing	3(3+0)
49	CS-3743	-	Multimedia Systems and Design	3(3+0)

Web Engineering Specialization Elective Courses(Any 9 Courses)				
50	CS-4744	CS-3548	Enterprise Application Development	3(3+0)
51	CS-4746	CMP-3310	E-Commerce Applications Development	3(3+0)
52	CS-4547	CMP-2123	Mobile Application Development	3(3+0)

53	CS-4544	CMP-3621	Cloud Computing	3 (3+ 0)
54	CS-4513	CS-3548	Web Engineering	3(3+0)
55	CS-4747	-	Semantic Web Techniques	3(3+0)
56	CS-4545	CS-3548	Mobile Computing	3(3+0)
57	CS-3811	CMP-2111	Artificial Intelligence	3 (3+0)
58	CS-3743	-	Multimedia Systems and Design	3(3+0)

Database Management Systems Specialization Elective Courses(Any 9 Courses)				
59	CS-3811	CMP-2111	Artificial Intelligence	3 (3+0)
60	CS-4441	CMP-3450	Data Warehousing	3(3+0)
61	CS-4442	CMP-3450	Data Mining	3(3+0)
62	CS-4443	CS-4441	Business Intelligence and Analytics	3(3+0)
63	CS-3441	CMP-3450	Database Administration & Management	3 (3+0)
64	CS-4444	CS-3450	Advance Database Management	3(3+0)
65	CS-4461	CMP-3450	Enterprise Resource Planning Systems	3(3+0)
66	IT-4365	-	Business Process Management	3(3+0)
67	CS-4861	-	Knowledge Management	3(3+0)
68	CS-3743	-	Multimedia Systems and Design	3(3+0)

Course Coding Scheme

Scheme for Course Code				
Discipline Code	Course Level	Course Category	Course Type	Course Number
2-4 Letters	1 Digit	1 Digit	1 Digit	1 Digits
XX - XXXX	0-9	0-9	0-9	0-9

Course Level		
Level	**Degree**	**Course Type**
1	**UNDER-GRADUATE**	Non-Credited Courses
2		Foundation + Core Level 1 Courses
3		Core Level 2 + Specialization Level 1
4		Specialization Level 2
5	**GRADUATE (MS/M.PHIL)**	Core + Specialization Level 1
6		Specialization Level 2
7	**PHD**	Specified
8		Specified

Course Type	
1	Theory Breadth
2	Theory + Practical (Breadth)
3	Multidisciplinary (Breadth)
4	Theory Depth
5	Theory + Practical (Depth)
6	Multidisciplinary (Depth)
7	Practical
8	Seminar
9	Research

Discipline Code	
CS	Computer Science
IT	Information Technology
SE	Software Engineering
CMP	Computing
SS	Social Studies
MATH	Mathematics
ENG	English
MNG	Management
PHY	Physics
ICT	Information & Communication Technologies

Course Categories		
0	**Introductory &General Courses**	
1	**Programming Fundamentals & Programming Languages , Discrete Structures, Algorithms and Complexity**	
		Programming Languages
		Discrete Structures
		Algorithms and Complexity
2	**Architecture and Organization**	
		Architecture and Organization
3	**Software Engineering (SE)**	
		Software Development Fundamentals
		Software Engineering
		Systems Fundamentals
4	**Information Systems**	
		Information Management
		Information Assurance and Security
5	**Net-Centric Computing (NC)**	
		Networking and Communications
		Parallel and Distributed Computing
		Technology Infrastructure
		Platform-based Development
6	**Operating Systems (OS)**	
		Operating Systems
7	**Human-Computer Interaction, Graphics and Visual Computing (GV)**	
		Human-Computer Interaction
		Graphics and Visual Computing
8	**Intelligent Systems (IS)**	
		Intelligent Systems
9	**Computational Science , Capstone Project & Professional Issues(CN)**	
		Social Issues and Professional Issues
		Computational Science

Scheme of Studies for BS Software Engineering Program
(138 Credit Hours)

(For Regular Track)

Semester 1 19 Cr. Hrs.	Semester 2 19 Cr. Hrs.	Semester 3 18 Cr. Hrs.	Semester 4 19 Cr. Hrs.	Semester 5 18 Cr. Hrs.	Semester 6 15 Cr. Hrs.	Semester 7 15 Cr. Hrs.	Semester 8 15 Cr. Hrs.
CMP-2122 4 (3+1) Programming Fundamentals	CMP-2123 4(3+1) Object Oriented Programming *	CMP-3112 3(3+0) Data Structures and Algorithms *	CMP-2540 3(3+0) Computer Communication and Networks *	CMP-3711 3(3+0) Human Computer Interaction *	SE-4349 3(3+0) ^^Software Project Management	CMP-4970 3(0+3) Capstone Project I *	CMP-4976 3(0+3) Capstone Project II *
ICT-2021 4 (3+1) Introduction to ICT***	MNG-2210 3(3+0) ^ Financial Accounting	CMP-3450 4(3+1) Database Systems *	SE-3342 3(3+0) ^^Software Requirement Engineering	SE-3344 3(3+0) ^^Software Construction	SE-4340 3(3+0) ^^Formal Methods in Software Engineering	SE-4342 3(3+0) ^^^SE Economics	MNG-3262 3(3+0) ^Entrepreneurship
MATH-2213 3(3+0) Calculus and Analytical Geometry **	SS-2410 3(3+0) ^Entrepreneurship	CMP-3310 3(3+0) Software Engineering *	SE-3311 3(3+0) ^^^Object Oriented Analysis and Design	SE-3341 3(3+0) ^^Software Testing & Quality Engineering	SE-4344 3(3+0) Software CASE Tools & Applications	CS-4547 3(3+0) Mobile Application Development	SS-4910 3(3+0) Professional Practice ***
PHY-2210 3(3+0) Basic Electronics **	CMP-2210 3(3+0) Digital Logic Design *	SS-2312 2(2+0) Pakistan Studies***	MNG-2215 3(3+0) ^^^Human Resource Management	SE-4343 3(3+0) ^^Software Design & Architecture	CS-4744 3(3+0) Enterprise Application Development	CS-4461 3(3+0) Enterprise Resource Planning Systems ****	CS-4544 3(3+0) Cloud Computing ****
ENG-2411 3(3+0) English-I (Functional English)***	ENG-2412 3(3+0) English-II (Communication Skills)***	ENG-2413 3(3+0) English-III (Technical and Report Writing)***	MATH-3215 3(3+0) Linear Algebra **	CS-3743 3(3+0) Multimedia Systems and Design ****	CS-3811 3(3+0) Artificial Intelligence ****	SE-4349 3(3+0) Model-Driven Software Development ****	SE-4345 3(3+0) Design Patterns ****
SS-2311 2(2+0) Islamic Studies***	CMP-2111 3(3+0) Discrete Structures *	MATH-2110 3(3+0) Probability and Statistics **	CMP-3621 4 (3+1) Operating Systems *	CS-3548 3(3+0) ^^^Web Systems and Technologies			

* Computing Core Courses
** SE Supporting (Math/Science) Elective Courses
***General Education Courses
^ University Elective Courses
^^ Software Engineering – Core Courses
^^^SE Supporting Courses
**** Specialization Elective Courses

Course Contentsfor BS Software Engineering

Contents of Computing Core Courses

1st Semester

Course Title: Programming Fundamentals
Course Code: CMP-2122
Course Structure: Lectures: 3 / Labs: 1
Credit Hours: 4
Prerequisites: None
Course Objectives:
The course is designed to familiarize students with the basic structured programming skills. It emphasizes upon problem analysis, algorithm designing, and program development and testing.

Course Syllabus:
Overview of Computer Programming.Principles of Structured and Modular Programming.Overview of Structured Programming Languages.Algorithms and Problem Solving. Program Development: Analyzing Problem, Designing Algorithm/Solution, Testing Designed Solution. Translating Algorithms into Programs.Fundamental Programming Constructs.Data Types.Basics of Input and Output.Selection and Decision (If, If-Else, Nested If-Else, Switch Statement and Condition Operator). Repetition (While and For Loop, Do-While Loops), Break Statement, Continues Statement. Control Structures. Functions.Arrays.Pointers.Records.Files. Testing & Debugging.

Course Outline:
1. Overview of Computer Programming: Machine Languages, Assembly Languages and High-Level Languages, History of C, C Standard Library, Typical C Program Development Environment, Memory Concepts, Arithmetic in C, Decision Making: Equality and Relational Operators. [Ch. 1,2]
2. Principles of Structured and Modular Programming : Algorithms, Pseudocode, Control Structures, The if Selection Statement, The if…else Selection Statement, The while Repetition Statement, Sentinel-Controlled Repetition, Nested Control Structures, Assignment Operators, Increment and Decrement Operators. [Ch. 3]
3. Program Control:Repetition Essentials, Counter-Controlled Repetition, for loop, switch Multiple-Selection Statement, do…while Repetition Statement, break and continue Statements, Logical Operators, Confusing Equality (==) and Assignment (=) Operators. [Ch. 4]
4. Functions:Function Definitions, Function Prototypes, Function Call Stack and Activation Records, Headers, Calling Functions By Value and By Reference, Scope Rules, Recursion, Fibonacci Series, Recursion vs. Iteration [Ch. 5]
5. Arrays:Defining Arrays, Array Examples, Passing Arrays to Functions, Sorting Arrays, Case Study: Computing Mean, Median and Mode Using Arrays, Searching Arrays, Multiple-Subscripted Arrays [Ch. 6]
6. Pointers:Pointer Variable Definitions and Initialization, Pointer Operators, Passing Arguments to Functions by Reference, Using the const Qualifier with Pointers, Bubble

Sort Using Call-by-Reference, sizeof Operator, Pointer Expressions and Pointer Arithmetic, Relationship between Pointers and Arrays, Arrays of Pointers, Case Study: Card Shuffling and Dealing Simulation, Pointers to Functions. [Ch. 7]

7. Characters and Strings:Fundamentals of Strings and Characters, Character-Handling Library, String-Conversion Functions, Standard Input/Output Library Functions, String-Manipulation Functions of the String-Handling Library, Comparison Functions of the String-Handling Library, Search Functions of the String-Handling Library, Memory Functions of the String-Handling Library, Other Functions of the String-Handling Library [Ch. 8]
8. Formatted Input/Output:Streams, Formatting Output with printf, Printing Integers, Printing Floating-Point Numbers, Printing Strings and Characters, Other Conversion Specifiers, Printing with Field Widths and Precision, Using Flags in the printf Format Control String, Printing Literals and Escape Sequences, Reading Formatted Input with scanf. [Ch. 9]
9. Structures, Unions, Bit Manipulations and Enumerations:Structure Definitions, Initializing Structures, Accessing Structure Members, Using Structures with Functions, typedef, Example: High-Performance Card Shuffling and Dealing Simulation, Unions, Bitwise Operators, Bit Fields, Enumeration Constants. [Ch. 10]
10. File Processing: Data Hierarchy, Files and Streams, Creating a Sequential-Access File, Reading Data from a Sequential-Access File, Random-Access Files, Creating a Random-Access File, Writing Data Randomly to a Random-Access File, Reading Data from a Random-Access File. [Ch. 11]

Textbook(s):

- C How to Program by Paul Deitel and Harvey Deitel, Prentice Hall; 7th Edition (March 4, 2012)

Reference Material:

- Programming in C by Stephen G. Kochan, Addison-Wesley Professional; 4 edition (September 25, 2013). ISBN-10: 0321776410

Course Title: Object Oriented Programming
Course Code: CMP-2123
Course Structure: Lectures: 3 / Labs: 1
2nd Semester
Credit Hours: 4
Prerequisites: CMP-2122(Programming Fundamentals)
Course Objectives:
The course aims to develop students' Object Oriented Programming skills.

Course Syllabus:

1. Objects and Classes, Abstraction, Encapsulation [TB1: Ch9-11]
2. Final Classes, Nested and Inner Classes. [TB2: Ch 5]
3. Inheritance, Abstract Classes, Concrete Classes, Inheritance and Encapsulation.[TB1: Ch12]
4. The is-a Relationship, Inheritance via Abstract Classes, Extending the Hierarchy, Upcasting and Downcasting, Interfaces.[TB1: Ch12]
5. Composition, the has-a Relationship.[TB1: Ch12]
6. Polymorphism.[TB1: Ch 13]

7. Polymorphism, Dynamic (or Late) Binding.[TB1: Ch 13]
8. Interfaces and Polymorphism.[TB1: Ch13]
9. The Wrapper Classes, Boxing and Un-Boxing, Packages.[TB1: Ch14, Ch9.4]
10. Exceptions and Exception Handling.[TB2: Ch 7]
11. File Systems and Paths, File and Directory Handling and Manipulation, Input/Output Streams, Reading Binary Data, Writing binary Data, Writing Text(Characters), Reading Text(Characters), Logging with PrintStream, Random Access Files, Object Serialization. [TB1: Ch 15]
12. Collections, for-each Loop.[TB1: Ch16, 17]
13. GUI Concepts, Components and Containers, Abstract Windows Toolkit and Swing, Windows and Frames, Layout Managers, Panels.[TB1: Ch 18]
14. Event-Driven Programming, The delegation Event Model.[TB1:Ch 19]
15. Event Classes, Mouse Events, Keyboard Events, Using Actions.[TB1: Ch19]
16. Component and JComponent, Buttons, Labels, Text Fields, Text Areas, Dialog Boxes, Checkboxes and Radio Buttons, Menus, JSlider, JTabbedPane.[TB1: Ch 19]

Textbook(s):

- Java Programming: From the Ground Up by Ralph Bravaco and Shai Simonson, McGraw-Hill Higher Education New York, 2010, ISBN 978–0–07–352335–4
- Ivor Horton's Beginning Java by Ivor Horton, John Wiley & Sons, Inc, 7th Edition, 2011, ISBN: 978-0-470-40414-0

Reference Material:

- Java™ Programming by Joyce Farrell, 6th Edition, Cengage Learning, 2012, ISBN-13:978-1-111-52944-4
- Java™ How to Program by Paul Deitel and Harvey Deitel, Pearson, 9th Edition, 2012, ISBN-13:978-0-13-257566-9

Course Title: Discrete Structures

Course Code: CMP-2111
Course Structure: Lectures: 3 / Labs: 0
Credit Hours: 3
Prerequisites: None

2nd Semester

Course Objectives:

The course provides a solid theoretical foundation of discrete structures as they apply to Computer Science problems and structures. The students will learn how to use mathematical notation and solve problems using mathematical tools.

Course Syllabus:

Logic: Propositional Equivalences, Predicates and Quantifiers, Nested Quantifiers, Methods of Proof. Sets & Functions. Algorithms: the Growth of Functions, Complexity of Algorithms, the Integers and Division, Matrices. Number Theory and Cryptography. Mathematical Reasoning: Proof Strategy, Sequences and Summations, Mathematical Induction, Recursive Definitions and Structural Induction, Recursive Algorithms, Program Correctness. The Basics of Counting: The Pigeonhole Principle, Permutations and Combinations, Binomial Coefficients, Generalized

Permutations and Combinations, Generating Permutations and Combinations. Advanced Counting Techniques: Recurrence Relations, Solving Recurrence Relations, Divide-and-Conquer Algorithms and Recurrence Relations, Generating Functions, Inclusion-Exclusion & its Application. Relations and Their Properties, n-ary Relations and Their Applications, Representing Relations, Closures of Relations, Equivalence Relations, Partial Orderings. Graph: Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths, Shortest-Path Problems, Planar Graphs, Graph Coloring. Trees: Applications of Trees, Tree Traversal, Spanning Trees, Minimum Spanning Trees.

Course Outline:

1. Logic: Propositional Equivalences, Predicates and Quantifiers, Nested Quantifiers, Methods of Proof. [TB: Ch. 1]
2. Sets & Functions. [TB: Ch. 2]
3. Algorithms: the Growth of Functions, Complexity of Algorithms, the Integers and Division, Matrices. [TB: Ch. 3]
4. Number Theory and Cryptography. [TB: Ch. 4]
5. Mathematical Reasoning: Proof Strategy, Sequences and Summations, Mathematical Induction, Recursive Definitions and Structural Induction, Recursive Algorithms, Program Correctness. [TB: Ch. 5]
6. The Basics of Counting: The Pigeonhole Principle, Permutations and Combinations, Binomial Coefficients, Generalized Permutations and Combinations, Generating Permutations and Combinations. [TB: Ch. 6]
7. Advanced Counting Techniques: Recurrence Relations, Solving Recurrence Relations, Divide-and-Conquer Algorithms and Recurrence Relations, Generating Functions, Inclusion-Exclusion & its Application. [TB: Ch. 8]
8. Relations and Their Properties, n-ary Relations and Their Applications, Representing Relations, Closures of Relations, Equivalence Relations, Partial Orderings. [TB: Ch. 9]
9. Graph: Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths, Shortest-Path Problems, Planar Graphs, Graph Coloring. [TB: Ch. 10]
10. Trees: Applications of Trees, Tree Traversal, Spanning Trees, Minimum Spanning Trees. [TB: Ch. 11]

Textbook(s):

- Discrete Mathematics and Its Applications by Kenneth H. Rosen, McGraw-Hill Science/Engineering/Math; 7th Edition (2011). ISBN-10: 0073383090

Reference Material:

- Discrete Mathematics by Richard Johnsonbaugh, Pearson; 7th Edition (January 8, 2008). ISBN-10: 0131593188
- Discrete Algorithmic Mathematics by Stephen B. Maurer and Anthony Ralston, A K Peters/CRC Press; 3rd Edition (August 2004). ISBN-10: 1568811667
- Discrete Mathematical Structures by Bernard Kolman, Robert Busby and Sharon C. Ross, Pearson; 6th Edition (2008). ISBN-10: 0132297515
- Discrete Mathematics with Ducks by sarah-marieBelcastro, A K Peters/CRC Press; 1st Edition (June 21, 2012). ISBN-10: 1466504994

3rd Semester

Course Title: Data Structure and Algorithms
Course Code: CMP-3112
Course Structure: Lectures: 3 / Labs: 0
Credit Hours: 3
Prerequisites: CMP-2123 (Object Oriented Programming)
Course Objectives:
This course provides an introduction to the theory, practice and methods of data structures and algorithm design. Students will learn elementary data structures such as stacks, queues, linked lists, sequences, trees and graphs in Java language, and the algorithms designed for manipulating these data structures.

Course Syllabus:
Introduction to Data Structure, primitive Java, Reference Types, Algorithm Analysis.Java collections API (The Java Collections Framework). Recursion, Sorting Algorithms: Bubble Sort, Selection Sort, Insertion Sort, Shell Sort, Merge Sort, Quick Sort, Heap Sort, Speed Limit for comparison Sorts, Radix Sort, Bucket Sort.Randomization. Stack and Queue. Linked Lists. Hash Table. Trees.Binary Search Trees.Priority Queue.Binary Heap.Splay Trees.Merging Priority Queues. Graphs: Simple Graphs, Graph Terminology, Paths and Cycles, Isomorphic Graphs, the Adjacency Matrix for a Graph, the Incidence Matrix for a Graph, the Adjacency List for a Graph, Digraphs, Paths in a Digraph, Weighted Digraphs and Graphs, Euler Paths and Hamiltonian Cycles, Dijkstra's Algorithm, Graph Traversal Algorithms. Data Structure Applications: Balanced-Symbol Checker, A simple Calculator, File Compression, A cross-reference generator, Thejosephus problem.Event-Driven Simulation.

Course Outline:
1. Introduction to Data Structure, primitive java, Reference Types, Algorithm Analysis.[TB1:Ch1, 2, 5]
2. Java collections API (The Java Collections Framework). [TB1:Ch 6]
3. Recursion, Sorting Algorithms (Bubble Sort, Selection Sort, Insertion Sort, Shell Sort).[TB1: Ch 6, 7]
4. Sorting Algorithms (Merge Sort, Quick Sort, Heap Sort, Speed Limit for comparison Sorts, Radix Sort, Bucket Sort), Randomization. [TB1: Ch 7, 8]
5. Stack and Queue. [TB1:Ch 16, TB2:Ch 6, 7]
6. Linked Lists. [TB1:Ch 16]
7. Linked Lists. [TB1:Ch 16, TB2:Ch8]
8. Hash Table. [TB1: Ch 20]
9. Trees. [TB1:Ch18]
10. Binary Search Trees, Priority Queue: the Binary Heap. [TB1: Ch 19, Ch 21]
11. Splay Trees, Merging Priority Queues. [TB1:Ch22, Ch23]
12. Graphs (Simple Graphs, Graph Terminology, Paths and Cycles, Isomorphic Graphs, the Adjacency Matrix for a Graph, the Incidence Matrix for a Graph, the Adjacency List for a Graph, Digraphs). [TB1:Ch14, TB2:16]

13. Graphs(Paths in a Digraph, Weighted Digraphs and Graphs, Euler Paths and Hamiltonian Cycles, Dijkstra's Algorithm, Graph Traversal Algorithms) [TB1:Ch14, TB2:16]
14. Data Structure Applications (Balanced-Symbol Checker, A Simple Calculator, File Compression, A Cross-reference Generator, The Josephus problem, Event-Driven Simulation) [TB: Ch 11, 12, 13]

Textbook(s):

- Data Structures & Problem Solving Using Java by Mark Allen Weiss,Addison-Wesley, 4th Edition (October 7, 2009). ISBN-10: 0321541405
- Schaum's Outline of Data Structures with Java by John Hubbard, McGraw-Hill; 2nd Edition (May 26, 2009). ASIN: B0035X1BQ6

Reference Book(s):

- Data Structures: Abstraction and Design Using Java by Koffman and Wolfgang, Wiley; 2nd Edition (January 26, 2010). ISBN-10: 0470128704
- Data Structures and Algorithm Analysis in Java by Mark Allen Weiss, Prentice Hall; 3rd Edition (November 28, 2011). ISBN-10: 0132576279

Course Title: Digital Logic Design

Course Code: CMP-2210
Course Structure: Lectures: 3/Labs: 0
Credit Hours: 3
Prerequisites: None

2nd Semester

Course Objectives:

The course introduces students with digital circuit of large complexity and how such circuits could be built in a methodological way, starting from Boolean logic and applying a set of rigorous techniques.

Course Syllabus:

Number Systems: Digital Systems, Number Systems and Codes. Unweighted Codes, Binary Storage and Registers, Binary Logic. Boolean Algebra and Logic Gates, Boolean Functions, Canonical and Standard Forms. Digital Logic Gates.Integrated Circuits. Gate-Level Minimization: The Map Method, Product of Sums Simplification, Don't-Care Conditions, NAND and NOR Implementation, Exclusive-OR Function, Karnaugh Maps, QuineMc-Cluskey Method. Combinational Logic: Combinational Circuits, Analysis Procedure, Design Procedure, Binary Adder-Subtractor, Decimal Adder, Binary Multiplier. Magnitude Comparator.Decoders.Encoders.Multiplexers. Synchronous Sequential Logic: Sequential Circuits, Latches, Flip-Flops, Registers and Counters. Memory and Programmable Logic: Random-Access Memory. Memory Decoding.Error Detection and Correction.Read-Only Memory.Programmable Logic Array.Programmable Array Logic.

Course Outline:

1. Number Systems, Operations, and Codes: Decimal Numbers, Binary Numbers, Decimal-to-Binary Conversion, Binary Arithmetic, I's and 2's Complements of Binary, Numbers,

Signed Numbers, Arithmetic Operations with Signed Numbers, Hexadecimal Numbers, Octal Numbers, Binary Coded Decimal (BCD), Digital Codes, Error Detection and Correction Codes. [Ch. 2]

2. Logic Gates: The Inverter, The AND Gate, The OR Gate, The NAND Gate, The NOR Gate, The Exclusive-OR and Exclusive-NOR Gates. [Ch. 3]
3. Boolean Algebra and logic Simplification: Boolean Operations and Expressions, Laws and Rules of Boolean Algebra, DeMorgan's Theorem, Boolean Analysis of Logic Circuits, Simplification Using Boolean Algebra, Standard Forms of Boolean Expressions, Boolean Expressions and Truth Tables, The Kamaugh Map, Karnaugh Map SOP Minimization, Karnaugh Map POS Minimization, Five-Variable Karnaugh Maps. [Ch. 4]
4. Combinational logic Analysis: Basic Combinational Logic Circuits, Implementing Combinational Logic, The Universal Property of NAND and NOR Gates, Combinational Logic Using NAND and NOR Gates. [Ch. 5]
5. Functions of Combinational logic: Basic Adders, Parallel Binary Adders, Ripple Carry versus Look-Ahead Carry Adders, Comparators, Decoders, Encoders. Code Conveners: Multiplexers (Data Selectors), Demultiplexers, Parity Generators/Checkers.[Ch. 6]
6. latches, Flip-Flops, and Timers: Latches, Edge-Triggered Flip-Flops, Flip-Flop Operating Characteristics, Flip-Flop Applications. [Ch. 7]
7. Counters: Asynchronous Counter Operation, Synchronous Counter Operation, Up/Down Synchronous Counters, Design of Synchronous Counters. [Ch. 8]
8. Shift Registers: Basic Shift Register Functions, Serial In/Serial Out Shift Registers, Serial In/Parallel Out Shift Registers, Parallel In/Serial Out Shift Registers, Parallel In/Parallel Out Shift Registers, Bidirectional Shift Registers, Shift Register Counters. [Ch. 9]
9. Memory and Storage: Basics of Semiconductor Memory, Random-Access Memories (RAMs), Read-Only Memories (ROMs), Programmable ROMs (PROMs and EPROMs), Flash Memories. [Ch. 10]
10. Programmable Logic: FPGA [Ch. 11]

Textbook(s):

- Digital Fundamentals by Thomas L. Floyd, Prentice Hall; 9th edition (2007)

Reference Material:

- Digital Fundamentals: A Systems Approach by Thomas L. Floyd, Prentice Hall; 1 edition (July 13, 2012)
- Digital Design, by M. Morris Mano, Michael D. Ciletti, 4th Edition, Prentice Hall (2007). ISBN-10: 0131989243
- Digital Design by Franc Vahid, Wiley; 1st Edition (July 28, 2006). ISBN-10: 0470044373
- Fundamentals of Logic Design by Jr. Charles H. Roth and Larry L Kinney, CL Engineering; 6th Edition (March 13, 2009). ISBN-10: 0495471690

Course Title: Operating Systems
Course Code: CMP-3621
Course Structure: Lectures: 3/ Labs: 1
Credit Hours: 4

4th Term

Pre-requisites: None

Course Objectives:
To help students gain a general understanding of the principles and concepts governing the functions of operating systems and acquaint students with the layered approach that makes design, implementation and operation of the complex OS possible.

Course Syllabus:
Computing Environments.Types and Generation of Operating-System.Key Components. Virtual Machines, System Calls, System Boot, System Programs. Processes, Process Scheduling, Operations on Processes, Inter-process Communication, Communication in Client-Server Systems. Threads: Multithreading Models, Thread Libraries, Threading Issues. CPU Scheduling, Scheduling Criteria, Scheduling Algorithms. Thread Scheduling, Algorithm Evaluation. Process Synchronization, The Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Classic Problems of Synchronization. Deadlocks Conditions & Handling.Main Memory Management.Virtual Memory Management.File-System and Implementation. I/O Systems: STREAMS, Hardware, Performance, Application I/O Interface, Kernel I/O Subsystem, Transforming I/O Requests to Bibliographical Notes, Hardware Operations. Case studies: Linux, Windows Operating Systems.

* Labs are preferred in this cours. Lab assignments involving different single and multithreaded OS algorithms.

Course Outline:
1. Introduction: Over view of: Operating Systems, Operating-System Structure, Operating-System Operations, Process management, Memory Management, Storage Management, Protection and Security, Protection and Security, Distributed Systems, Special-Purpose Systems, Computing Environments. [TB: Ch1]
2. Operating-System Structures: Operating-System Services, Operating-System Structure, User Operating-System Interface, Virtual Machines, System Calls, Operating-System Generation, Types of System Calls, System Boot, System Programs. [TB:Ch2].
3. Processes: Process Concept, Process Scheduling, Operations on Processes, Interprocess Communication, Communication in Client- Server Systems. Threads: Multithreading Models, Thread Libraries, Threading Issues. [TB: Ch. 3, 4]
4. CPU Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms, Multiple-Processor Scheduling, Thread Scheduling, Algorithm Evaluation. [TB: Ch. 5]
5. Process Synchronization: Background, Monitors, The Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Classic Problems of Synchronization. [TB: Ch. 6]
6. Deadlocks: System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock. [TB: Ch. 7]
7. Main Memory: Swapping, Contiguous Memory Allocation, Paging, Structure of the Page Table, Segmentation, Example: The Intel Pentium. [TB: Ch.8]
8. Virtual Memory: Allocating Kernel Memory, Demand Paging, Copy-on-Write, Page

Replacement, Allocation of Frames, Thrashing. [TB: Ch. 9]

9. File-System Implementation: File-System Structure, Log-Structured File Systems, File-System Implementation, Directory Implementation, Allocation Methods, Free-Space Management, Efficiency and Performance, Recovery. [TB: Ch. 11]
10. I/O Systems: STREAMS, Hardware, Performance, Application I/O Interface, Kernel I/O Subsystem, Transforming I/O Requests to Bibliographical Notes, Hardware Operations. [TB: Ch. 13]
11. Security: The Security Problem, Computer-Security, Program Threats, Classifications, System and Network Threats, Cryptography as a Security Tool, User Authentication, Implementing Security Defenses, Firewalling to Protect Systems and Networks. [TB: Ch. 15]
12. Case studies: Linux, Windows Operating Systems

Textbook(s):

- Operating System Concepts Essentials by Abraham Silberschatz, Peter B. Galvin and Greg Agne, Wiley; 8th Edition (July 5, 2008). ISBN-10: 0470128720

Reference Material:

- Applied Operating Systems Concepts by Silberschatz A., Peterson, J.L., & Galvin P.C. Wiley; 8th Edition (2011). ISBN-10: 1118112733
- Modern Operating Systems by Tanenmaum A.S., Prentice Hall; 3rd Edition (2007). ISBN-13: 978-0136006633

Course Title: Database Systems
Course Code: CMP-3450
Course Structure: Lectures: 3/ Labs: 1
Credit Hours: 4
Prerequisites: None
Course Objectives:

3rd Term

The course aims to introduce basic database concepts, different data models, data storage and retrieval techniques and database design techniques. The course primarily focuses on relational data model and DBMS concepts.

Course Syllabus:

Basic Concept: File Processing & Database Approach, Database Applications, Advantages of the DB, Components of the DB Environment, and Evolution of DBs. Database Architecture: DB Development Process, Three Schema Architecture, Data Modeling. Logical Design: E-R Modeling (Entities, Attributes, Relationships; Cardinality Constraints). RDBMS: Logical View of Data, Relational Data Model, Constraints, Transforming ERD/EERD into Relations. The Relational Model: Types, Relations, Relational Algebra, Relational Calculus, Integrity. Normalization. EE-R Diagrams: Development & Constraints, DB Design Life Cycle. DB Development & Management: Introduction to SQL and Basic Commands, SQL Integrity Constraints. Physical DB Design, DB architecture, Query Optimization. SQL Commands: Saving, Listing, Editing, Restoring Table Contents; Logical Operators, Management Commands, Arithmetic Operators, Complex Queries and SQL Functions, Aggregate Function, Grouping

Functions, Virtual Tables, Views, Indexes, Joins. Clint-Server & Distributed Environment, ODBC, Bridges, and Connectivity Issues. Concurrency Control with Locking, Serializability, Deadlocks, Database Recovery Management.Distributed Processing and Distributed Databases, DDBMS: Evolution, Architecture, Components, Advantages, Security and Authorization. Physical Design: Storage and File Structure, Efficiency and Tuning.

Course Outline:

1. Databases Overview: Basic Concept; File Processing & Database Approach, Database Applications, Advantages of the DB, Components of the DB Environment, Evolution of DBs.
2. Database Architecture: DB Development Process, Three Schema Architecture, Data Modeling, E-R Modeling (Basic Concepts)
3. Logical Design: E-R Modeling (Entities, Attributes, Relationships; Cardinality Constraints), RDBMS: Logical View of Data; The Relational Data Model
4. Logical Design:Constraints, Transforming ERD/EERD into Relations
5. The Relational Model: Types, Relations, Relational Algebra, Relational Calculus, Integrity
6. Normalization: First Normal Form, Second Normal Form
7. Normalization: Third Normal Form (3NF), Boyce Codd Normal Form (BCNF)
8. EE-R Diagrams: Development & Constraints, DB Design Life Cycle,
9. DB Development & Management: Introduction to SQL and Basic Commands, SQL Integrity Constraints.
10. Physical DB Design, DB architecture, Query Optimization
11. SQL Commands: Saving, Listing, Editing, Restoring Table Contents; Logical Operators, Management Commands
12. Arithmetic Operators, Complex Queries and SQL Functions, Aggregate Function, Grouping Functions
13. Virtual Tables, Views, Indexes, Joins
14. Clint-Server & Distributed Environment, ODBC, Bridges, and Connectivity Issues.
15. Concurrency Control with Locking, Serializability, Deadlocks, Database Recovery Management.
16. Distributed Processing and Distributed Databases,DDBMS: Evolution, Architecture, Components, Advantages, Security and Authorization. Physical Design: Storage and File Structure, Efficiency And Tuning

Textbook(s):

1. Modern Database Management by Fred McFadden, Jeffrey Hoofer, Mary Prescott, Prentice Hall; 11th Edition (July 26, 2012). ISBN-10: 0132662256
2. Database Systems A Practical Approach to Design, Implementation, and Management, 4th Edition, Thomas Connolly, Carolyn Begg, Addison Wesley, 2005.
3. Introduction to Oracle: SQL and PL/SQL ISBN-10: 0131453203

Reference Material:

- Database Design and Relational Theory: Normal Forms and All That Jazz by C. J. Date, O'Reilly Media; 1st Edition (April 24, 2012). ISBN-10: 1449328016
- Fundamentals of Database Systems by R. Elmasri and S. Navathe. 6th Edition, Addison-Wesley (2010). ISBN-10: 0136086209

- Database System Concepts by Abraham Silberschatz, Henry F. Korth and S. Sudarshan. McGraw-Hill; 6th Edition (2010). ASIN: B004Y3YXK2
- Database Systems: a Practical Approach to Design, Implementation and Management by T.Connolly and C.Begg, Addison-Wesley; 5th Edition (2009). ISBN-10: 0321523067
- Modern Database Management System by Fred, Jeffery A. Hoffer and Fred McFadden; Prentice Hall; 7th Edition (April 6, 2004). ISBN-10: 0131453203

Course Title: Software Engineering
Course Code: CMP-3310
Course Structure: Lectures: 3/ Labs: 0
Credit Hours: 3
Prerequisites: None
Course Objectives:
To study various software development models and software development life cycles. The concepts of project management, change control, process management, software development and testing are introduced through hands-on team Projects.

Course Syllabus:
The Nature of Software, Nature of WebApps, The Software Process, Software Engineering Practice. Generic Process Models.Specialized Process Models.Systems Analysis and Design.Business Information Systems.Introduction to SDLC, SDLC Phases, System Planning, Preliminary Investigation, SWOT Analysis.Strategic Planning.Information Systems Projects.Requirements Engineering.Data & Process Modeling. Design within the Context of Software Engineering. Design Models. System Architecture.Architectural Styles.User Interface Design.Software Quality Assurance.Validation Testing, System Testing, Internal and External View of Testing.Project Management Concepts.Project Scheduling. Risk Management. Maintenance and Reengineering.

Course Outline:
1. The Nature of Software, Unique Nature of WebApps, Software Engineering, The Software Process, Software Engineering Practice, Software Myths. [TB1: Ch. 1]
2. Generic Process Models: Framework Activity, Task Set, Process Patterns, Process Improvement, CMM, Prescriptive Process Models: Waterfall Model, Incremental Process Model, Evolutionary Process Model. [TB1: Ch. 2]
3. Specialized Process Models: Component Based Development, The Formal Methods Models, Agile Development. [TB1: Ch. 2-3]
4. Introduction to Systems Analysis and Design, Business Information Systems, Information System Components, Types of Information Systems, Evaluating Software, Make or Buy Decision. [TB1: Ch. 1]
5. Introduction to SDLC, SDLC Phases, System Planning, Preliminary Investigation. SWOT Analysis. [TB1: Ch. 2]
6. The Importance of Strategic Planning, Information Systems Projects, Evaluation of Systems Requests, Preliminary Investigation, Systems Analysis, Requirements Modeling, Fact-Finding Techniques. [TB1: Ch. 2-3]
7. Requirements Engineering, Establishing the Groundwork, Eliciting Requirements,

Developing Use Cases, Building the Requirements Model. [TB1: Ch. 5]

8. Requirements Modelling Strategies, Difference between Structured Analysis and Object Oriented Analysis; Difference between FDD Diagrams & UML Diagrams. [TB2:Ch. 3]
9. Data & Process Modelling, Diagrams: Data Flow, Context, Conventions, Detailed Level DFD's Diagram 0, Levelling, Balancing, Logical Versus Physical Models. [TB2: Ch. 4]
10. Design Within the Context of Software Engineering, The Design Process, Design Concepts, Design Models: Data Design Elements. [TB1: Ch. 8]
11. Architecture Design Elements, Interface Design Elements, Component-Level Design Elements, Deployments Design Elements. [TB: Ch. 8]
12. System Architecture, Architectural Styles, User Interface Design: The Golden Rules, User Interface Analysis and Design, WebApps Interface Design. [TB1: Ch. 9-11]
13. Software Quality Assurance: Background Issues, Elements of Software Quality Assurance, Software Testing Strategies, Strategic Issues, Test Strategies for Conventional Software. [TB1: Ch.16-17]
14. Validation Testing, System Testing, Internal and External View of Testing: White Box Testing and Black Box Testing Techniques. [TB1: Ch. 17-18)]
15. Introduction to Project Management, Project Scheduling: Gantt Chart, Risk Management: Proactive versus Reactive Risk Strategies, Software Risks, Maintenance and Reengineering: Software Maintenance, Software Reengineering. [TB1: Ch. 28-29]

Textbook(s):

- Software Engineering: A Practitioner's Approach by Roger S. Pressman, McGraw-Hill Science/Engineering/Math; 7th Edition (2009). ISBN-10: 0073375977
- Systems Analysis and Design by Gary B. Shelly, Thomas J. Cashman and Harry J. Rosenblatt, Course Technology; 7th Edition (2007). ISBN-10: 1423912225

Reference Material:

- Software Engineering 8E by Ian Sommerville, Addison Wesley; 8th Edition (2006). ISBN-10: 0321313798
- Systems Analysis and Design by Gary B. Shelly, Thomas J. Cashman and Harry J. Rosenblatt, Course Technology; 7th Edition (2007). ISBN-10: 1423912225

Course Title: Computer Communication and Networks

Course Code: CMP-2540

~~Course Structure: Lectures: 3/ Labs: 0~~ 4th Term

Credit Hours: 3

Prerequisites: None

Course Objectives:

To introduce students with concepts related to computer communication, analogue & digital transmission, network layers, network models (OSI, TCP/IP) and protocol standards. Emphasis is given on the understanding of modern network concepts.

Course Syllabus:

Introduction to Data Communications, Communications Models, Data Networking, and the Internet.Protocol & Architecture.Protocol & Architecture.Data Transmission.Signal Encoding Techniques.Digital Data Communication Techniques.Data Link Control Protocols.Multiplexing.Circuit Switching and Packet Switching.Cellular Wireless Networks

Technology &Protocols.Local Area Network Technology & Protocols.Ethernet Technology & Protocols. Wireless LANs: Wireless LAN Technology and Protocols.

Course Outline:

1. Introduction to Data Communications, Communications Models, Data Networking, and the Internet. [TB1: Ch. 1]
2. Protocol & Architecture: The OSI Model, Layered Architecture, Physical, Data Link and Network Layers, Transport, Session, Presentation and Application Layers. [TB1: Ch. 2]
3. Protocol & Architecture: TCP/IP, and Internet-Based Applications. [TB1: Ch. 2]
4. Data Transmission: Concepts and Terminology, Analog and Digital Data Transmission, Transmission Impairments and Channel Capacity, Transmission Media: Guided, Wireless, Line-of-Sight. [TB1: Ch. 3, 4]
5. Signal Encoding Techniques: Digital Data, Digital Signals; Digital Data, Analog Signals; Analog Data, Digital Signals; Analog Data, Analog Signals. [TB1: Ch. 5]
6. Digital Data Communication Techniques: Asynchronous and Synchronous, Types of Errors, Error Detection, Error Correction, Line Configurations. [TB1: Ch. 6]
7. Data Link Control Protocols: Flow Control, Error Control, High-Level Data Link Control (HDLC). [TB1: Ch. 7]
8. Multiplexing: Frequency-Division, Synchronous Time-Division, Statistical Time-Division, Asymmetric Digital Subscriber Line, xDSL. [TB1: Ch. 8]
9. Circuit Switching, Packet Switching Concepts, Principles and Architecture, Asynchronous Transfer: Role, Architecture and Services. [TB1: Ch. 9]
10. Circuit Switching and Packet Switching: Switched Communication Networks, Circuit-Switching, Circuit-Switching Concepts, Softswitch Architecture, Packet Switching Principles. [TB1: Ch. 11]
11. Cellular Wireless Networks: Principles of Cellular Networks, First-Generation Analog, Second-Generation CDMA, Third-Generation Systems, Fourth-Generation Systems. [TB1: Ch. 13]
12. Local Area Network: Topologies and Transmission Media, LAN Protocol Architecture, Bridges, Hubs and Switches, Virtual LANs. [TB1: Ch. 15]
13. Ethernet: Traditional Ethernet, High-Speed Ethernet, IEEE 802.1Q VLAN Standard. [TB1: Ch. 16]
14. Wireless LANs: Wireless LAN Technology, IEEE 802.11 Architecture and Services, IEEE 802.11 Medium Access Control, IEEE 802.11Physical Layer, IEEE 802.11 Security Considerations. [TB1: Ch. 17]

Textbook(s):

- Data and Computer Communications by William Stallings, Prentice Hall; 9th Edition (August 13, 2010). ISBN-10: 0131392050

Reference Material:

- Data Communications and Networking by BehrouzForouzan, 4th Edition (2007). ISBN 978-007-125442-7
- Computer Networks by Andrew S. Tanenbaum and David J. Wetherall, Prentice Hall; 5th Edition (October 7, 2010). ISBN-10: 0132126958
- Computer Networks and Internets by Douglas E. Comer, Prentice Hall; 5th Edition (April

28, 2008). ISBN-10: 0136066984

5th Term

Course Title: Human Computer Interaction
Course Code: CMP-3711
Course Structure: Lectures: 3/Labs: 0
Credit Hours: 3
Prerequisites: None

Course Objectives:
This course focuses on the basic concepts of how human perceives and interacts with computers. Through a set of exercises, students will acquire the ability to critique problems that exist in current interactive software and websites. Students will also learn several usability evaluation methods.

Course Syllabus:
The human.The computer.The interaction Models.Interaction design basics.HCI in the software process. Design rules. Implementation support.Evaluation techniques.Universal design.User support.Task analysis. Dialog notations and design. Models of the system.Modeling rich interaction.Groupware.Ubiquitous computing and augmented realities. Hypertext, multimedia and the World Wide Web.

Course Outline:
1. The human: Input–output channels, Human memory, Thinking, Emotion, Individual differences, Psychology and the design of interactive systems. [Ch. 1]
2. The computer: Text entry devices, Positioning, pointing and drawing, Display devices, Devices for virtual reality and 3D interaction, Physical controls, sensors and special devices, Paper: printing and scanning, Memory, Processing and networks. [Ch. 2]
3. The interaction: Models of interaction, Frameworks and HCI, Ergonomics, Interaction styles, Elements of the WIMP interface, Interactivity, The context of the interaction, Experience, engagement and fun. [Ch. 3]
4. Interaction design basics: What is design? The process of design, User focus, Scenarios, Navigation design, Screen design and layout, Iteration and prototyping. [Ch. 5]
5. HCI in the software process: The software life cycle, Usability engineering, Iterative design and prototyping, Design rationale. [Ch. 6]
6. Design rules: Principles to support usability, Standards, Guidelines, Golden rules and heuristics, HCI patterns. [Ch. 7]
7. Implementation support: Elements of windowing systems, Programming the application, Using toolkits, User interface management systems.[Ch. 8]
8. Evaluation techniques: What is evaluation? Goals of evaluation, Evaluation through expert analysis, Evaluation through user participation, Choosing an evaluation method. [Ch. 9]
9. Universal design: Universal design principles, Multi-modal interaction, Designing for diversity.[Ch. 10]
10. User support: Requirements of user support, Approaches to user support, Adaptive help systems, Designing user support systems. [Ch. 11]
11. Task analysis: Differences between task analysis and other techniques, Task

decomposition, Knowledge-based analysis, Entity–relationship-based techniques, Sources of information and data collection, Uses of task analysis [Ch. 15]

12. Dialog notations and design: What is dialog? Dialog design notations, Diagrammatic notations, Textual dialog notations, Dialog semantics, Dialog analysis and design. [Ch. 16]
13. Models of the system: Standard formalisms, Interaction models, Continuous behaviour.
14. Modeling rich interaction: Introduction, Status–event analysis, Rich contexts, Low intention and sensor-based interaction. [Ch. 18]
15. Groupware: Groupware systems, Computer-mediated communication, Meeting and decision support systems, Shared applications and artifacts, Frameworks for groupware, Implementing synchronous groupware. [Ch. 19]
16. Ubiquitous computing and augmented realities: Ubiquitous computing applications research, Virtual and augmented reality, Information and data visualization. [Ch. 20]
17. Hypertext, multimedia and the World Wide Web: Understanding hypertext, Finding things, Web technology and issues, Static web content, Dynamic web content. [Ch. 21]

Textbook(s):

- Human-Computer Interaction by Alan Dix, Janet E. Finlay, Gregory D. Abowd, Russell Beale, Prentice Hall; 3rd Edition (December 20, 2003). ISBN-10: 0130461091

Reference Material:

- Human-Computer Interaction: Concepts And Design by J. Preece, Y. Rogers, H. Sharp, D. Benyon, S. Holland, T. Carey, Addison Wesley; 1st Edition (April 30, 1994). ISBN-10: 0201627698.
- Human-Computer Interaction Handbook: Fundamentals, Evolving Technologies, and Emerging Applications by Julie A. Jacko, CRC Press; 3rd Edition (May 4, 2012). ISBN-10: 1439829438
- Interaction Design: Beyond Human - Computer Interaction by Yvonne Rogers, Helen Sharp, and Jenny Preece, Wiley; 3rd Edition (June 15, 2011). ISBN-10: 0470665769
- Designing with the Mind in Mind: Simple Guide to Understanding User Interface Design Rules by Jeff Johnson, Morgan Kaufmann; 1st Edition (June 3, 2010). ISBN-10: 012375030X

Course Title: Capstone Project

7th Term

Course Code: CMP-4970
Course Structure: Lectures: 0/Labs: 6
Credit Hours: 6
Prerequisites: None
Course Objectives:

The Capstone Project is an opportunity for participants to put their leadership competencies into practice. Capstone Project allows the student to identify and develop a project that puts into practice the leadership skills and competencies learned during the courses of study. Detailed guideline and documentation temples are available with the Department.

Contents of Software Engineering Core Courses

Course Title: Software Requirement Engineering

Course Code: SE-3342
Course Structure: Lectures: 3/Labs: 0
Credit Hours: 3
Prerequisites: CMP-3310 (Software Engineering)
Course Objectives:
To understand Issues in Requirements Engineering, to understand and apply Requirements Engineering Process, to understand and use Requirements Elicitation andSpecification, to understand and use Formal Techniques, to understand modeling and analysis of Non-Functional Requirements.

Course Syllabus:
Basics of Requirements Engineering.RE Processes.Requirements Analyst Role, Tasks, Essential Skills & Knowledge.Dealing with Customers.Prototype Categories. Evaluation, Risks. Validating the Requirements. Documenting the Requirements.Non Functional Requirements. Software Quality Attributes. Setting Requirements Priorities.Special Requirements Challenges. Requirements Development Plans. Requirements Management Principles and Practices.Requirements Creeping.Tracing Requirements.Tools for Requirements Management.Software Requirements Risk Management.

Course Outline:
1. Requirements Engineering (RE): Essential Software Requirement,Bad Requirements. Characteristics and Benefits Requirement Engineering, Requirements from the Customer's Perspective [TB: Ch. 1&2]
2. RE Processes: Requirements Elicitation, Requirements Analysis, Requirements Specification, Requirements Validation, Requirements Management, and Requirements Development Process [TB: Ch. 3].
3. The Requirements Analyst Role, Tasks, Essential Skills & Knowledge, Defining the Vision through Business Requirements, Vision and Scope Document[TB: Ch. 4&5]
4. Dealing with Customers: Elicitation Techniques, Interviews, Surveys, Workshops. Classifying Customer Input, Incomplete Requirements (Finding Missing Requirements)[TB: Ch. 7+ handouts]
5. Prototype Categories (Throwaway, evolutionary, paper and electronic), evaluation, Risks. Validating the Requirements: Requirements Review and Inspection, Requirements Review Challenges, Acceptance Criteria [TB: Ch. 13 & Ch. 15].
6. Documenting the Requirements: The Software Requirements Specification, Labelling, Dealing with Incompleteness, User Interfaces and the SRS, A Software Requirements Specification Template, The Data Dictionary [TB: Ch. 10].
7. Non Functional Requirements: Software Quality Attributes: Defining, Performance Requirements, Defining Non-functional Requirements Using Planguage, Attribute Tradeoffs, Implementing Non-functional Requirements [TB: Ch. 12].
8. Setting Requirements Priorities: Why Prioritize Requirements? Play With Priorities, A Prioritization Scale, Prioritizing Based on Value, Cost, and Risk [TB: Ch. 14].
9. Special Requirements Challenges: Requirements for Maintenance Projects, Begin Capturing

Information, New Requirements Techniques, Follow the Traceability Chain, Consider Business Rules, Requirements for Outsourced Projects, Requirements for Emergent Projects [TB: Ch. 16].

10. Requirements Development Plans, Estimation, Scheduling, From Requirements to Designs, Code, Tests and Success [TB: Ch. 17].
11. Requirements Management Principles and Practices, Baseline, Procedures, Requirements Version Control, Tracking Requirements Status, [TB: Ch. 18].
12. Requirements Creeping, Managing Scope Creep, The Change Control Process, The Change Control Board, Change-Control Tools, Measuring Change Activity, Impact Analysis [TB: Ch. 19].
13. Tracing Requirements introduction, The Requirements Traceability Matrix, Tools for Requirements Traceability, Requirements Traceability Procedure, Is Requirements Traceability Feasible? [TB: Ch. 20].
14. Tools for Requirements Management: Benefits and Capabilities of tool for Requirements Management, Requirements Management Automation, Selecting a Tool, Changing the Culture [TB: Ch. 21].
15. Software Requirements Risk Management: Fundamentals, Elements, Documenting Project Risks, Planning for Risk Management, Requirements-Related Risks [TB: Ch. 23]

Class Assignments:

- The requirements are for the development of case applications. Ask students to outline business requirements, the product vision and scope for applications.
- Use case elicitation using automated tools e.g. UML, Mobile Scenarios and PDA's etc
- Development of Software Requirement Specification (SRS)
- Requirement Engineering Group Discussion activity and resource allocation etc

Textbook(s):

- Software Requirements 2 by Karl Wiegers, 2nd Edition (2003). Microsoft Press; ISBN-10: 0735618798

Reference Material:

- Requirements Engineering: Processes and Techniques, Kotonya and Sommerville, John Wiley Sons, 1998. ISBN-10: 0471972088
- Software Requirements Engineering, 2nd Edition by Richard H. Thayer and Merlin Dorfman, Wiley-IEEE Computer Society Pr; 2nd Edition (1997). ISBN-10: 0818677384
- Requirements Engineering: From System Goals to UML Models to Software Specifications by A. van Lamsweerde, Wiley; 1st Edition (2009). ISBN-10: 0470012706.
- Requirements Engineering: Fundamentals, Principles, and Techniques by Klaus Pohl, Springer; 1st Edition (July 23, 2010). ISBN-10: 3642125778
- Requirements Engineering by Hull, Jackson, and Dick, Springer; 3rd Edition (October 11, 2010). ISBN-10: 1849964041

Course Title: Software Construction

Course Code: SE-3344
Course Structure: Lectures: 3/Labs: 0
Credit Hours:3
Prerequisites: CMP-2122 (Programming Fundamentals)
Course Objectives:

5th Term

Upon completion of this course, students will have the ability to apply a wide variety of software construction techniques and tools, including state-based and table-driven approaches to low-level design of software.

Course Syllabus:
Introduction to Software Construction.Importance of Prerequisites of Target Software. Key Construction Decisions: Choice of Programming Language, Programming Conventions, Localization Aspects of Technology, Selection of Construction Practices. Design in Software Construction. Design Building Blocks. Defensive Programming.The Software-Quality Considerations.Collaborative Construction.Refactoring.Program Size & Software Construction.Managing Software Construction.Integration.Programming Tools.Layout and Style.Self-Documenting Code.

Course Outline:

1. Software Construction: What Is Software Construction? Why Is Software Construction Important? Metaphors for Software Development, The Importance of Metaphors, How to Use Software Metaphors, Common Software Metaphors. [TB1: Ch. 1, 2]
2. Prerequisites: Importance of Prerequisites, Type of Target Software, Problem-Definition Prerequisite, Requirements Prerequisite, Architecture Prerequisite, Time Constraints. [TB1: Ch. 3]
3. Key Construction Decisions: Choice of Programming Language, Programming Conventions, Localization Aspects of Technology, Selection of Construction Practices. [TB1: Ch. 4]
4. Design in Software Construction: Design Challenges, Key Design Concepts, Design Building Blocks: Heuristics, Design Practices, Popular Methodologies. [TB1: Ch. 5]
5. Defensive Programming: Protecting Your Program From Invalid Inputs, Assertions, Error Handling Techniques, Exceptions, Barricade Your Program to Contain the Damage Caused by Errors, Debugging Aids, Determining How Much Defensive Programming to Leave in Production Code, Being Defensive About Defensive Programming, The Pseudocode. [TB1: Ch. 8]
6. The Software-Quality Landscape: Characteristics of Software Quality, Techniques for Improving Software Quality, Relative Effectiveness of Quality Techniques, When to Do Quality Assurance, Principle of Software Quality. [TB1: Ch. 20]
7. Collaborative Construction: Overview of Collaborative Development Practices, Pair Programming, Formal Inspections, Other Kinds of Collaborative Development Practices. [TB1: Ch. 21]
8. Refactoring: Kinds of Software Evolution, Introduction to Refactoring, Reasons to Refactor, Specific Refactorings, Refactoring Safely, Refactoring Strategies. [TB1: Ch. 24]
9. Program Size & Software Construction: Communication and Size, Range of Project Sizes, Effect of Project Size on Errors, Effect of Project Size on Productivity, Effect of Project Size on Development Activities. [TB1: Ch. 27]
10. Managing Construction: Encouraging Good Coding, Configuration Management, Estimating a Construction Schedule, Measurement, Treating Programmers as People, 8.6 Managing Your Manager. [TB1: Ch. 28]
11. Integration: Importance of the Integration Approach, Integration Frequency—Phased or Incremental? Incremental Integration Strategies, Daily Build and Smoke Test. [TB1: Ch.

29]

12. Programming Tools: Design Tools: Source-Code Tools, Executable-Code Tools, Tool-Oriented Environments, Building Your Own Programming Tools, Tool Fantasyland. [TB1: Ch. 30]
13. Layout and Style: Layout Fundamentals, Layout Techniques, Layout Styles, Laying Out Control Structures, Laying Out Individual Statements, Laying Out Comments, Laying Out Routines, Laying Out Classes. [TB1: Ch. 31]
14. Self-Documenting Code: External Documentation, Programming Style as Documentation, To Comment or Not to Comment, Keys to Effective Comments, Commenting Techniques. [TB1: Ch. 32]

Textbook(s):

- Code Complete: A Practical Handbook of Software Construction by Steve McConnell, Microsoft Press; 2nd Edition (July 7, 2004). ISBN-10: 0735619670

Reference Material:

- Compiler Construction (International Computer Science Series) by Niklaus Wirth, Addison-Wesley Pub (Sd); (1996). ISBN-10: 0201403536.
- Object-Oriented Software Construction (Book/CD-ROM) (2nd Edition) by Bertrand Meyer, Prentice Hall; 2nd Edition (2000). ISBN-10: 0136291554.
- The Design of Well-Structured and Correct Programs, S. Alagic& M.A. Arbib, Springer-Verlag (1978), ISBN 0-387-90299-6.
- Object-Oriented Software Construction, by Bertrand Meyer, Second Edition, Published by, Prentice Hall in 1997. Prentice Hall; 2nd Edition (March 21, 2000). ISBN-10: 0136291554

Course Title: Software Testing and Quality Engineering

5th Term

Course Code: SE-3341
Course Structure: Lectures: 3/Labs: 0
Credit Hours: 3
Prerequisites: CMP-3310 (Software Engineering)
Course Objectives:
The objective of this course is to make students have ability to understand Software Quality Engineering concepts and practice.

Course Syllabus:
A Quality Principles, Benefits of Quality, Organization and Process Benchmarking. Ethical and Legal Compliance.Standards and Models.Leadership Skills.Quality Management System.Methodologies for Quality Management. Audit Types, Audit Roles and Responsibilities. Audit Process. Project Tracking and Control, Tracking Methods, Project Reviews and Program Reviews. Software Verification and Validation Method, Software Product Evaluation. Testing Planning and Design.Reviews and Inspection. Test Execution Documentation. Customer Deliverables.Configuration Control and Status Accounting.

Course Outline:

1. A Quality Principles, Benefits of Quality, Organization and Process Benchmarking [TB:

Ch. No.1]

2. Ethical and Legal Compliance: ASQ Code of Ethics, Legal and Regularity Issues [TB: Ch. No.2]
3. Standards and Models: ISO 9000 Standards, IEEE Software Engineering Standards, SEI Compatibility Maturity Model Integration (CMMI).[TB: Ch. No.3]
4. Leadership Skills: Organizational Leadership, Facilitation Skills, Communication Skills [TB: Ch. No.4]
5. Team Skills, Team Management, Team Tools [TB: Ch. No.5]
6. Quality Management System: Quality Goals and Objectives, Customers and Other Stakeholders, Planning, Outsourcing [TB: Ch. No.6]
7. Methodologies for Quality Management: Cost of Quality, Process Improvement Models. Corrective Action Procedures, Defect Prevention [TB: Ch. No.7]
8. Audit Types, Audit Roles and Responsibilities, Audit Process [Ch. No.8]
9. Project Tracking and Control, Tracking Methods, Project Reviews and Program Reviews [TB: Ch. No.16]
10. Software Verification and Validation Method, Software Product Evaluation [TB: Ch. No.21]
11. Testing Planning and Design: Test Strategies, Test Plans, Test Design, Test Coverage Specifications, Code Coverage Techniques, Test Environments, Test Tools [TB: Ch. No.22]
12. Reviews and Inspection: Peer Reviews, Formal Versus Informal Reviews, Types of Peer Reviews, Walk-Throughs, Inspections, Technical Reviews [TB: Ch. No.23]
13. Test Execution Documentation: Test Execution, Test Case, Test Procedure, Test Log, Problem Report, Test Result Data and Metrics, Test Report [TB: Ch. No.24]
14. Customer Deliverables: Peer Reviews, Development Testing, Development Audits, Pilots, Installation Testing, Customer/User Testing [TB: Ch. No.25]
15. Configuration Control and Status Accounting: Item, Baseline, Version Control, CCB, Concurrent Development, and Status Accounting, Configuration Audit [TB: Ch. No.28-29]

Textbook(s):

- The Certified Software Quality Engineer by Linda Westfall, Quality Press; (September 28, 2009), ISBN-10: 0873897307

Reference Material:

- Software Quality Assurance: Principles and Practice by Nina S. Godbole, published by Alpha Science (2004). ISBN-10: 1842651765.
- Software Testing: Fundamental Principles and Essential Knowledge by James D. McCaffrey, BookSurge Publishing (2009). ISBN-10: 1439229074.
- Perfect Software: And other illusions about testing by Gerald M. Weinberg, published Dorest House (2008). ISBN-10: 0932633692.
- Software Quality Engineering: Testing, Quality Assurance, and Quantifiable Improvement by Jeff Tian, published by John Wiley & sons, (2005). ISBN-10: 0471713457
- Mastering Software Quality Assurance: Best Practices, Tools and Techniques for Software Developers by MuraliChemuturi, J. Ross Publishing (2010). ISBN-10: 1604270322.

Course Title: Software Design & Architecture
Course Code: SE-4343
Course Structure: Lectures: 3/Labs: 0
Credit Hours: 3
Prerequisites: SE-3342 (Software Requirement Engineering)
Course Objectives:
Upon completion of this course, students will develop the ability to apply a wide variety of design patterns, frameworks, and architectures in designing a wide variety of software.

Course Syllabus:
Basics of Software Architecture (SA).Characteristics of SA, Importance of SA, SA Business Cycle and Software Processes, Architectural Patterns.SA Case Study. Creating Architecture, Quality Attributes, Business Qualities, Architecture Qualities. Achieving Qualities.Global Analysis.Conceptual Architecture View.Module Architecture View.Execution Architecture View.Code Architecture View.Designing & Documenting the Architecture. Analyzing Architectures.The CBAM.Reconstructing Software Architectures.

Course Outline:
1. Software Architecture (SA): SA in Context, SA as a Design Plan, Abstraction, SA Terminology, 4+1 Views Model: Coupling Between Views, Uses and Notation of Four Views. IS2000: The Advanced Imaging Solution, Chapter 1 [TB 1:Ch. 1, Ch. 2]
2. Characteristics of SA, Importance of SA, SA Business Cycle and Software Processes, SA History, "Good" Architecture, Architectural Patterns, Reference Models, and Reference Architectures, Architectural Structures and Views [TB 2: Ch.1, Ch.2]
3. SA Case Study: A-7E Avionics System - Architecture, Business Cycle, Requirements and Qualities [TB 2: Ch. 3]
4. Creating Architecture: Understanding Quality Attributes, Functionality and Architecture, Architecture and Quality Attributes, System Quality Attributes, Quality Attribute Scenarios in Practice, Other System Quality Attributes, Business Qualities, Architecture Qualities [TB 2: Ch. 4]
5. Achieving Qualities: Introducing Tactics, Availability Tactics, Modifiability Tactics, Performance Tactics, Security Tactics, Testability Tactics, Usability Tactics, Relationship of Tactics to Architectural Patterns, Architectural Patterns and Styles [TB 2: Ch. 5]
6. Global Analysis: Overview of Global Analysis Activities, Analyze Factors, Develop Strategies., Analyze Organizational Factors, Begin Developing Strategies, Analyze Technological Factors, Continue Developing Strategies, Analyze Product Factors, Continue Developing Strategies [TB 1: Ch. 3]
7. Conceptual Architecture View: Design Activities for the Conceptual Architecture View, Global Analysis, Central Design Tasks: Components, Connectors, and Configuration, Final Design Task: Resource Budgeting, Traceability, Uses for the Conceptual Architecture View [TB 1: Ch. 4]
8. Module Architecture View: Design Activities for the Module Architecture View, Global Analysis, Central Design Tasks: Modularization and Layering, Final Design Task: Interface Design, Traceability, Uses for the Module Architecture View [TB 1: Ch. 5]
9. Execution Architecture View: Design Activities for the Execution Architecture View, Global Analysis, Central Design Tasks: Runtime Entities, Communication Paths, and Configuration, Final Design Task: Resource Allocation, Traceability, Uses for the Execution Architecture

View [TB 1: Ch. 6]

10. Code Architecture View: Design Activities for the Code Architecture View, Global Analysis, Central Design Tasks, Final Design Tasks, Traceability, Uses for the Code Architecture View [TB 1: Ch. 7]
11. Designing & Documenting the Architecture: Architecture in the Life Cycle, Designing the Architecture, Forming Team, Creating a Skeletal System. Documenting Software Architectures, Uses of Architectural Documentation, Views, Choosing the Relevant Views, Documenting a View, Documentation across Views, Unified Modelling Language [TB 2: Ch. 7, Ch. 9]
12. Analyzing Architectures: The ATAM - A Comprehensive Method for Architecture Evaluation, Participants in the ATAM, Outputs of the ATAM, Phases of the ATAM, The Nightingale System: A Case Study in Applying the ATAM [TB 2: Ch. 11]
13. The CBAM: A Quantitative Approach to Architecture Design Decision Making, Decision-Making Context, The Basis for the CBAM, Implementing the CBAM, Case Study: The NASA ECS Project, Results of the CBAM Exercise [TB 2: Ch. 12]
14. Reconstructing Software Architectures: Introduction, Information Extraction, Database Construction, View Fusion, Reconstruction [TB 2: Ch. 10]

Class Assignments:

- Planning and Practice of existing software design methodologies.
- Outline of requirements, the existing design & architecture practices using up to date tools and technologies.
- Applications of Software Development Life Cycle (SDLC), its phases and thus implementation of different process models.
- Efficient use of different modeling and design tools e.g. UML (for code generation), open source code development etc.
- Writing of Software Design Specifications.

Textbook(s):

1. Applied Software Architecture by Christine Hofmeister, Robert Nord and DilipSoni, Addison-Wesley Professional (1999). ISBN-10: 0201325713.
2. Software Architecture in Practice by Len Bass, Paul Clements and Rick Kazman, Addison-Wesley Professional; 2nd Edition (April 19, 2003). ISBN-10: 0321154959

Reference Material:

- Software Architecture in Practice by Len Bass, Paul Clements and Rick Kazman, Addison-Wesley Professional; 3rd Edition (2012). ISBN-10: 0321815734
- Software Architecture and Design Illuminated by Kai Qian, Xiang Fu, Lixin Tao and Chong-weiXu, Jones & Bartlett Publishers; 1st Edition (2009). ISBN-10: 076375420X
- Software Architecture: Foundations, Theory, and Practice by R. N. Taylor, N. Medvidovic and E. M. Dashofy, Wiley; 1st Edition (2009). ISBN-10: 0470167742.

Course Title: Software Project Management
Course Code: SE-4349
Course Structure: Lectures: 3/ Labs: 0
Credit Hours: 3
Prerequisites: CMP-3310 (Software Engineering)

6 To Term

Course Objectives:
To develop students' ability to plan and manage software development projects successfully, maximizing the return from each stage of the software development life cycle.

Course Syllabus:
Introduction to Software Project Management, PM Tools, PMI's Knowledge Areas, PMI Framework, PMI Process Groups. Understanding Organizations.Project Planning.Project Evaluation.Selection of an Appropriate Approach in Project.Software Effort Estimation.Activity Planning. Risk Management. Evaluating the Risks to the Schedule. Risk Control, RMMM, Configuration Management & Maintenance, Environment for Configuration Control. Resource Allocation.Monitoring & Control.Review and Evaluation.Challenges of Outsourcing in Project Management, Presentations.

Course Outline:
1. Introduction: Software Project Versus Other Type of Projects Dimensions of a Software Project, Activities in SPM, Setting Goals & Objectives, Business Case, Significance of Processes, Project Vs. Program Management, [TB1: Ch. 1, Handouts]
2. Introduction of PM Tools, PMI's Knowledge Areas, Technical Fundamentals in SPM, Lifecycle Relationships, Classic Mistakes Product-Process-Peoples-Technology Mistakes [TB2, Handouts]
3. PMI Framework, PMI Process Groups: Process Initiating Process Group, Planning Process Group, Executing Process, Process Monitoring and controlling, Closing Process Group, Project Charter, Statement of Work.[TB2, Handouts]
4. Understanding Organizations, Organizational Structures, Functional -Project -Matrix, Organizational Impact on Projects, Identifying stakeholders: Define Responsibilities, Authority Relationships, Position Qualifications [TB2, Handouts]
5. Project Planning: Project Selection, Project Scope, Project Infrastructure, Analyze Project Characteristics, Identify Project & Product Activities, Work Break Down Structure [TB1: Ch. 3]
6. Project Evaluation: Strategic Assessment, Technical Assessment, Economic Assessment, Project Portfolio Management, Cost-Benefit Analysis, Cash Flow Forecasting, Cost-Benefit Evaluation Techniques, Procurement Management, Procurement Tools &Techniques, Types of Contracts [TB1: Ch. 2]
7. Selection of an Appropriate Approach in Project: Choosing Technologies, Technical Plan, Waterfall Model, V-Model, Spiral Model, Software Prototyping, Incremental Delivery, Agile Process Model: Dynamic Systems Development Method, Extreme Programming, Selection of Most Appropriate Process Model [TB1: Ch. 4]
8. Software Effort Estimation: Work Breakdown Structure (WBS) and Its Types, Estimation Problems, Software Estimation Techniques: Expert Judgment, Estimating By Analogy, LOC, Function Point Estimation, and COCOMO [TB1: Ch. 5]
9. Activity Planning: Project and Activities, Sequencings and Scheduling Activities, Network Planning Models, Formulation of Network Model, Adding the Time Dimensions, The Forward Pass, The Backward Pass, Identifying the Critical Path, Identifying the Critical Activities Project, AOA, GanttChart, (Installation & Configuration of Software Tools like MS-Project).[TB1: Ch. 6]
10. Risk Management: Categories of Risks, A Framework for Dealing with Risks, Evaluating the Risks to the Schedule: PERT, Importance of Risk, Types Of Risk, Risk Identification

Techniques, Project Risk and Change Management [TB1: Ch. 7]

11. Risk Control, RMMM, Configuration Management & Maintenance, Environment for Configuration Control, Configuration Control vs. Version Control [TB1: Ch. 7, OLM]
12. Resource Allocation: Nature of Resources, Identifying Resource Requirements, Scheduling Resources, Resource Scheduling Techniques[TB1: Ch. 8]
13. Monitoring & Control: Creating Framework, Collecting Data, Visualizing Progress. Cost Monitoring, Earned Value, Change Control [TB1: Ch. 9]
14. Review and Evaluation: Determining Satisfaction of Requirements, Reviewing And Evaluating Performance, Project Closure: Project Documentation, Cutover/Migration, Quality Standards, Project Closing. [TB2]
15. Challenges of Outsourcing in Project Management, Presentations

Textbook(s):

- Software Project Management by Bob Hughes and Mike Cotterell, McGraw-Hill Education; 5th Edition (2009). ISBN-10: 0077122798
- A Guide to the Project Management Body of Knowledge, 3rd Edition (PMBOK Guides), ISBN-13: 978-1930699458

Reference Material:

- Applied Software Project Management by Andrew Stellman and Jennifer Greene, O'Reilly Media; 1st Edition (2005). ISBN-10: 0596009488
- Software Project Survival Guide (Pro -- Best Practices) by Steve McConnell, Microsoft Press; 1st Edition (1997), ISBN-10: 1572316217
- Mastering Software Project Management: Best Practices, Tools and Techniques by Murali K. Chemuturi and Thomas M. Cagley Jr., J. Ross Publishing (2010). ISBN-10: 1604270349
- Effective Project Management: Traditional, Agile, Extreme by Robert K. Wysocki, Wiley; 6th Edition (2011). ISBN-10: 111801619X
- The Software Project Manager's Handbook - Principles that work at work by Dwayne Phillips, 2nd Edition, IEEE Computer Society Press and Wiley Inter-science, 2004. ISBN 0-471-67420-6

Course Title: Formal Methods in Software Engineering

Course Code: SE-4340
Course Structure: Lectures: 3/Labs: 0
Credit Hours: 3
Prerequisites: None
Course Objectives:

6th Term

Modern software development inevitably requires the design and analysis of a number of different artifacts. Formal methods allow the mathematically precise formulation of some of these artifacts. This course is an introduction to the use of formal methods for the specification. design, and automatic analysis of software systems.

Course Syllabus:

Introduction to Formal methods, Introducing Z, Elements of Z, Logic, Using Predicates in Z, Schemas and Schema Calculus, Formal Reasoning, Case Studies in Z, Computer Graphics and Computational Geometry. Rule-Based Programming, Graphical User Interface, Safety-Critical Protection System, Modeling Large Systems, Object-Oriented Programming Model and Z,

Concurrency and Real-time, Refinement, Program Derivation and Formal Verification, Converting Z into Code.

Course Outline:

1. Formal methods: What are FM? What FM are not, When, How, and Why use FM? Popular Fallacies and Alternatives. Formal Methods and Project Management: Gathering Requirement, From Information Requirement to Formal Specifications, Validating Formal Specifications. [TB: Ch. 1,2,3]
2. Introducing Z: What is Z? Informal Requirements, Data Flow Diagrams, State Transition Diagram, State Transition Diagram, State Transition tables. Introducing schemas: Basic Types and Abbreviations, Axiomatic Descriptions, State Schemas, Operation Schemas, Implicit preconditions, Schema Calculus. [TB: Ch. 4,5, 6, 7]
3. Elements of Z: Sets and Types, Declarations, Variables, Expressions, Operators, Predicates, Equations and Laws. Structure: Tuple, Records, Relations, Tables, Databases, Pairs and Binary Relations, Functions, Sequences, Operators. [TB: Ch. 8,9]
4. Logic: Basic Predicates, Using Predicates in Z, Relations as Predicates, Logical Connectives, Logic and Natural Language, Quantifiers, Z and Boolean Types, Predicates and undefined Expressions. Synthesis: Set Comprehensives, Lambda Expressions, Formal Specifications, Conveniences and shortcuts, Modeling Systems and Change. [TB: Ch. 10, 11]
5. Schemas and schema calculus: Conjunctions and Disjunctions, Other Schema Operators. Schema types and Bindings: Generics & Free Types [TB: Ch. 12, 13,14]
6. Formal Reasoning: Calculation and proof, Laws, Checking Specifications, Preconditions, Formal Reasoning and Intuition, Machine-Checked proof. [TB: Ch.15]
7. Studies in Z: Document Control System, Text Processing, Eight Queens [[TB: Ch. 16, 17, 18]
8. Computer Graphics and Computational Geometry. Rule-Based Programming: Essential Elements, Facts and Rules, Deducing New Facts, Checking the Rules, Specifying Rule Based Programs. [TB: Ch. 19, 20]
9. Graphical User Interface: Events, Display and Dialogs, Selecting a Display, Changing Setting Value, Z and State Transition Systems, Changing the Machine State. [TB: Ch. 21]
10. Safety-Critical Protection System: Partition, Refinement, Enforcing the Safety Requirements. [TB: Ch. 22]
11. Modeling Large Systems: A Single Subsystem, Many Subsystems, Useful Idioms, Subsystems, Conditions, and Modes. [TB: Ch. 23].
12. Object-Oriented Programming Model and Z, Inherits and Schema Inclusion, OO Z Dialects. Concurrency and Real-time [TB: Ch. 24, 25].
13. Refinement, Program Derivation and Formal Verification [TB: Ch. 26, 27]
14. Converting Z Specification into Code.

Textbook(s):

- The Way of Z: Practical Programming with Formal Methods by Jonathan Jacky, Cambridge University Press (November 28, 1996). ISBN-10: 0521559766

Reference Material:

- Z: An Introduction to Formal Methods by Antoni Diller, Wiley; 2nd Edition (July 27, 1994). ISBN-10: 0471939730
- Model Checking by Edmund M. Clarke Jr., OrnaGrumberg, Doron A. Peled , MIT Press, 1st Edition (1999). ISBN-13: 978-0262032704.

- Reactive Systems: Modelling, Specification and Verification by Luca Aceto, Anna Ingólfsdóttir, Kim Guldstrand Larsen and Jiri Srba, Cambridge University Press (August 13, 2007). ISBN-10: 0521875463
- Fundamentals of Algebraic Specifications: Equations and Initial Semantics, H. Ehrig& B. Mahr, Springer-Verlag (1985), ISBN 0-387-13718-1.
- Systems and Software Verification: Model-Checking Techniques and Tools. By B. Berard, M. Bidoit, A. Finkel, F. Laroussinie, A. Petit, L. Petrucci, and P. Schnoebelen, Springer, 1st Edition , 2001. ISBN-10: 3642074782
- Algebraic Specifications in Software Engineering by I. Van Horebeek& J. Lewi, Springer; 1st Edition (December 19, 1989). ISBN-10: 3540516263

Contents of General Education Required Courses

Course Title: Functional English (English I)
Course Code: ENG-2411
Course Structure: Lectures: 3/ Labs: 0
Credit Hours: 3
Prerequisites: None

1st Team

Course Objectives:

In today's employment market employers are looking for people who can articulate clearly, take and pass on messages, deal with customers effectively, read, understand and follow a wide range of documents and write fluently and accurately, using accepted business conventions of format, spelling, grammar and punctuation. Functional English course is developed to strengthen students' these skills which enable them to deal with the practical problems and challenges of life – at home, in education and at work.

Course Syllabus:

Punctuation.Writing Mechanics. Vocabulary: Frequently Confused Words, Frequently Misused Words, Phrases, Synonyms, Antonyms, Idioms, General Vocabulary. Use Of Articles and One, A Little/ A Few, This, That, Care, Like, Love, Hate, Prefer, Wish, All, Each, Every, Both, Neither, Either, Some, Any, No, None. Interrogatives.Kins of Nouns.Prepositions. Possessive, Personal, Reflexive, and Relative Pronouns and Clauses. Classes of Verbs. Usage of May, Can, Ought, Should, Must, Have To, Need for Obligation; Must, Have, Will and Should. The Auxiliaries Dare and Used. Present, Past, Future and Perfect Tenses. The Gerund &The Participles. Commands, Requests, Invitations, Advice, Suggestions.The Subjunctive. The Passive Voice; Indirect Speech, Conjunctions, Purpose. Clauses: Noun Clauses; Clauses of Reason, Result, Concession, Comparison, Time. Numerals, Dates, and Weights and Measures.Spelling Rules.Phrasal Verbs.Irregular Verbs.

Course Outline:

1. Punctuation: Periods, Question Marks, Exclamation Marks, Semicolons, Colons, Commas, Apostrophes, Quotation Marks.

2. Writing Mechanics: Capitals, Abbreviations; Vocabulary: Frequently Confused Words, Frequently Misused Words,
3. Vocabulary: Phrases, Synonyms, Antonyms, Idioms, General Vocabulary
4. Use Of Articles And One, A Little/ A Few, This, That, Care, Like, Love, Hate, Prefer, Wish, All, Each, Every, Both, Neither, Either, Some, Any, No, None; Interrogatives: Wh-? Words And How?
5. Kins of Nouns; Kinds of Adjectives; Adverbs: Kinds, Form, Position and Use
6. Prepositions; Possessive, Personal and Reflexive Pronouns; Relative Pronouns and Clauses
7. Classes of Verbs: Ordinary Verbs, Auxiliary Verbs (Be, Have, Do); May and Can for Permission and Possibility; Can and Be Able for Ability; Ought, Should, Must, Have To, Need for Obligation; Must, Have, Will and Should for Deduction and Assumption; The Auxiliaries Dare and Used
8. The Present Tenses
9. The Past and Perfect Tenses
10. The Future; The Infinitive
11. The Gerund & The Participles; Commands, Requests, Invitations, Advice, Suggestions; The Subjunctive
12. The Passive Voice; Indirect Speech
13. Conjunctions, Purpose
14. Clauses: Noun Clauses; Clauses of Reason, Result, Concession, Comparison, Time
15. Numerals, Dates, and Weights And Measures; Spelling Rules;
16. Phrasal Verbs; List Of Irregular Verbs

Textbook(s):

- A Practical English Grammar by A. J. Thomson and A. V. Martinet,4th Edition Oxford University Press (1986).
- Basic English Usage by Michael Swan, Oxford UnivPr (Sd) (January 1986). ISBN-10: 0194311872

Reference Material:

- Functional English In Aglobal Society: Vocabulary Building and Communicative Grammar by Nicanor L. Guintomary Ann R. Sibal Brian D. Villaverde Dept. of Languages, Literature and Humanities College of Arts and Sciences Southern Luzon State University (2012).
- AQA Functional English Student Book: Pass Level 2 by Mr David Stone, Heinemann; 1st Edition (28 Jun 2010). ISBN-10: 0435151401
- English Composition and Grammar: Complete Course by John E. Warriner, Harcourt Brace Jovanovich; Complete Course Benchmark Edition (January 1988). ISBN-10: 0153117362
- Companion to English: Vocabulary (Learners Companion) by George Davidson, Prim-Ed Publishing (March 1, 2003). ISBN-10: 9814070904
- Word Power Made Easy by Norman and Lewis, Goyal Publishers (September 1, 2009). ISBN-10: 8183071007
- 1000 Most Important Words by Norman W. Schur, Ballantine Books (July 12, 1982). ISBN-10: 0345298632

- High School English Grammar and Composition by P.C Wren, Chand & Co (July 13, 2008). ISBN-10: 812192197X

Course Title: Communication Skills (English II)
Course Code: ENG-2412
Course Structure: Lectures: 3/ Labs: 0
Credit Hours: 3
Prerequisites: None

2nd Text.

Course Objectives:

- To sensitize students to their communicative behavior
- To enable them to reflect and improve on their communicative behavior/performance
- To build capacities for self criticism and facilitate growth
- To lead students to effective performances in communication

Course Syllabus:

Communication. The Communication Process. Perspectives in Communication. Internal Representation. Elements of Communication. Listening. Expressing. Clarifying Language. Making Contact. Prejudgment. Influencing Others. Public Speaking. Preparing A Formal Oral Presentation. Delivering Presentation. Interviewing. Effective Written Communication. Building Rapport.

Course Outline:

1. Communication Skills: What Is Communication, The Importance of Communication, What Are Communication Skills? The Communication Process : Source, Message, Encoding, Channel , Decoding , Receiver, Feedback, Context . Perspectives in Communication: Introduction, Visual Perception, Language, Other Factors Affecting Communication Perspective, Past Experiences, Prejudices, Feelings, Mood, Relationship, Environment.
2. Internal Representation:Introduction, Internal Representation of Our World, Language as a Representational System, Verbal Clues, Visual Representation System, Auditory Representational System, Kinaesthetic Representational System, Auditory Digital Representational System, Eye Movements as an Indication, Visual Recall, Visual Construct, Auditory Recall, Auditory Construct, Kinaesthetic, Internal Auditory, Phrases for Use in Response to Each Representational System.
3. Elements of Communication:Introduction, Face to Face Communication, Tone of Voice, Body Language, Verbal Communication, Physical Communication. Communication Styles: Introduction, The Communication Styles Matrix, Direct Communication Style, Spirited Communication Style, Systematic Communication Style, Considerate Communication Style, Examples of Communication for Each Style, Direct Style, Spirited Style, Systematic Style Considerate Style.
4. Listening: Real Vs. Introduction, Self-Awareness, Pseudo Listening, Active Listening, Blocks to Listening, Assessing Your Listening, Four Steps to Effective Listening, Total Listing, Becoming an Active Listener.
5. Expressing: The Four Kinds of Expression, Whole Message, Contaminated Messages, Preparing Your Message, Practicing Whole Message, Rules of Effective Expression.

Body Language: Body Movement, Spatial Relationships. Paralanguage and Meta-messages: The Element of Paralanguage, Changing Your Paralanguage, Meta-message, Coping with Meta-message. Hidden Agendas: The Eight Agendas, Purpose of the Agenda.

6. Clarifying Language: Understanding a Model, Challenging the Limits of a Model, Challenging Distortion in a Model. Assertiveness: Your Legitimate Right, Three Communication Styles, Identifying Communication Style, Your Assertive Goals, Assertive Expression and Listening, Combining Assertive Expression and Listening, Responding to Criticism, Special Assertive Strategies.
7. Making Contact: Fear of Stranger, Guidelines for Making Contact, The Art of Conversation, Putting It All Together. Negotiations: Four Stages of Negotiation, Dealing with Conflicts, Rules of Principles Negotiation, When The Going Get Tough.
8. Prejudgment: Prejudgment Traps, Stereotypes, Approval and Disapproval in Prejudgment, Parataxic Distortion, Perpetuating Illusion, Clarifying First Impression. Validation Strategies: What is validation, Why Does Validation Work? What Validation Is Not? Components of Validation, Successful Validation Strategies, The Power of Validation.
9. Influencing Others: What is Persuasion? Persuading Audience, Ineffective Strategies for Influencing Change, Effective Strategies, for Influencing Others, Your Plan for Influencing Change, Lisa's Plan for Influencing Change Art of Persuasion.
10. Public Speaking: Defining Your Purpose, Outlining The Subject, Presentation, Organization, Audience Analysis, Style, Supporting Materials, The Outline, Delivery, Dealing with Stage Fright.
11. Preparing A Formal Oral Presentation:Presentation Design: Introduction, Consistency, Aspects of Consistency Language, Color, Fonts, Images, Contrast, Alignment, Simplicity, White Spaces, Charts, Graphics & Tables, How to Choose Which Type of Graph to Use? Graph Types, Multimedia Presentations, Adding Quotations.
12. Delivering Presentation: Introduction, Delivery,Managing Voice, Passion, Language, Movement, Facial Expressions, Body Language, Some Useful Tips: Active Listening, Inventing Stories, Feed back, Preliminary Preparations Proximity, Tension & Nerves, Questions, Tips to Handle Questions, Habits, Handling Tough Situations, Common Mistakes & Their Remedies, Dealing with Unexpected Disasters, Presentation for International Audience, Dealing People with Disabilities, Things to Remembers, Last Minute Tips.
13. Interviewing:Clarifying What You Want, If You are the Interviewer, If You Are the Interviewee.
14. Effective Written Communication: Introduction, When and When Not to Use Written Communication, Complexity of the Topic, Amount of 'Discussion' Required, Shades of Meaning Formal Communication, Writing Effectively, Subject Lines, Put the Main Point First, Know Your Audience, Organization of the Message.
15. Building Rapport:Introduction, Six Steps to Building Rapport, Match the Person's Sensory Modality, Mirror the Person's Physiology, Match the Person's Voice, Match the Person's Breathing, Match the Way the Person Deals with Information, Match Common Experiences, Calibration, Perceptual Positions.

Textbook(s):

- Effective Communication Skills, MTD Training &Ventus Publishing ApS.(2010) ISBN 978-87-7681-598-1 (TB1)
- Messages: The Communication Skills Book by Matthew McKay PhD , Martha Davis PhD, and Patrick Fanning, New Harbinger Publications; Third Edition (March 3, 2009). ISBN-10: 1572245921
- Secrets of Successful Presenters: A Guide for Successful Presenters by Dr. M. A. Pasha &Dr. S. Pasha, Lambert Academic Publishing (2012). ISBN-10:3659217557

Reference Material:

- Communication Skills in English by Prof P N Kharu, Dr.Varinder Gandhi Publisher: Laxmi. EAN: 9788131806920
- Essential Communication Skills: Teacher Edition with Talking Points by Patty Ann, Patty Ann; 1st Edition (July 5, 2012). ASIN: B008HYUDWQ
- Communication Skills Magic: Improve Your Relationships & Productivity through Better Understanding Your Personality Style and the Personality Styles of Those Around You by E.G. Sebastian, CreateSpace Independent Publishing Platform (January 5, 2010). ISBN-10: 1450513344
- People Skills: How to Assert Yourself, Listen to Others, and Resolve Conflicts by Robert Bolton,Touchstone (June 6, 1986). ISBN-10: 067162248X
- The Handbook of Communication Skills by Owen Hargie, Routledge; 4th Edition, Taylor & Francis, (12-Oct-2012).

Course Title: Technical and Report Writing (English III)

Course Code: ENG-2413

Course Structure: Lectures: 3/ Labs: 0

Credit Hours: 3

Prerequisites:None

3rd Term

Course Objectives:

To effectively plan and structure technical reports and to recognize the various stages in writing a technical report.

Course Syllabus:

Writing for Readers.Academic, Public, and Work Communities.Analyzing Electronic Communities.Discovering and Planning. Purpose, Thesis, and Audience.Drafting. Revising. Editing, and Proofreading. Paragraphs.Clear and Emphatic Sentences.Reasoning Critically.Reading Critically.Arguing Persuasively.Designing Documents.Writing in Online Communities.Speaking Effectively. Academic Writing for Social and Natural Sciences. Public Writing. Researching and Writing.

Course Outline:

1. Writing for Readers: Academic, Public, and Work Communities; Analyzing Electronic Communities; c. Myths and Realities about Writing.
2. Discovering and Planning: Discovering Topics; Generating Ideas; Organizing Information; Planning in Digital Environments.
3. Purpose, Thesis, and Audience: Identifying Your Focus and Purpose; Creating a Thesis;

Understanding Your Readers.

4. Drafting: Moving from Planning to Drafting, Drafting Collaboratively, Drafting in Digital Environments.
5. Revising, Editing, and Proofreading: Making Major Revisions; Making Minor Revisions; Revising Collaboratively; Revising in Digital Environments; Editing; Editing Collaboratively; Proofreading.
6. Paragraphs: Unfocused Paragraphs; Revising for Focus; Incoherent Paragraphs; Revising for Coherence; Poorly Developed Paragraphs; Revising for Development; Using Special-Purpose Paragraphs.
7. Clear and Emphatic Sentences: Unclear Sentences; Revising for Clear Sentences; Revising for Variety and Emphasis.
8. Reasoning Critically: Recognizing Critical Reasoning, Building a Chain of Reasoning, Representing Your Reasoning.
9. Reading Critically: Reading to Understand; Reading to Respond and Evaluate; Using Journals to Turn Reading into Writing.
10. Arguing Persuasively: Recognizing an Issue, Developing Your Stance, Creating an Argumentative Thesis, Developing Reasons and Evidence, Acknowledging Other Perspectives, Arguing Logically, Writing a Position Paper.
11. Designing Documents: Goals of Document Design, Format Choice, Layout, Type Choice, Visuals, Sample Documents. Creating a Visual Argument: Presenting an Issue, Providing Evidence.
12. Writing in Online Communities: Online Expectations, E-mail Conventions, Online Communities, Web Pages, Avoiding Plagiarism and Behaving Ethically Online.
13. Speaking Effectively: Oral Presentations, Preparing an Oral Presentation, Managing Speech Anxiety, Fielding Questions.
14. Academic Writing: Social and Natural Sciences: Goals of Writing in the Social and Natural Sciences, Audiences in the Social and Natural Sciences, Writing Tasks in the Social and Natural Sciences, Types of Writing in the Social and Natural Sciences, Abstract, Informative Report, Lab Report, Research Report;
15. Public Writing: Goals of Public Writing, Public Audiences, Public Writing Tasks, Types of Public Writing, Public Flyer, Letter to the Editor, Oral Presentation.
16. Researching and Writing: Beginning Your Research, Types of Research Writing, Developing a Research Question, Developing a Preliminary Thesis, Creating a Research File and a Timeline, Reading and Notetaking, Summarizing, Paraphrasing, and Synthesizing.

Textbook(s):

- Writer's Companion – The Longman by Chris M. Anson, Robert A. Schwegler and Marcia F. Muth, Pearson Longman, 4th Edition (2007) . ISBN10: 0-20556-252-3

Reference Material:

- Technical English: Writing, Reading, and Speaking by Pickett and Laster. 8th Edition
- The Technical Writer's Companion byAlred, Gerald, Charles T. Brusaw and Walter E. Oliu, 3rd Edition. ISBN 0-312-25978-6.

Course Title: Islamic Studies
Course Code: SS-2311
Course Structure: Lectures: 2 / Labs: 0
Credit Hours: 2
Prerequisites: None

Course Objectives:
This course is aimed at:

- To provide Basic information about Islamic Studies
- To enhance understanding of the students regarding Islamic Civilization
- To improve Students skill to perform prayers and other worships
- To enhance the skill of the students for understanding of issues related to faith and religious life.

Course Syllabus:
Attached as Annexure A

Course Title: Pakistan Studies
Course Code: SS-2312
Course Structure: Lectures: 2/ Labs:0
Credit Hours: 2
Prerequisites: None

Course Objectives:

- Develop vision of historical perspective, government, politics, contemporary Pakistan, ideological background of Pakistan.
- Study the process of governance, national development, issues arising in the modern age and posing challenges to Pakistan.

Course Syllabus:
Attached as Annexure B

1st Term

Course Title: Introduction to Information & Communication Technologies
Course Code: ICT-2021
Course Structure: Lectures: 3/Labs: 1
Credit Hours: 4
Prerequisites: None

Course Objectives:
The course introduces students to information and communication technologies and their application in the workplace. Students will get basic understanding of computer software, hardware, and associated technologies. They will also learn how computers are used in the workplace, how communications systems can help boost productivity, and how the Internet technologies can influence the workplace.

Course Syllabus:
Introduction to Computers, The Internet and World Wide Web, Application Software, The System Unit, Input Devices, Output Devices, Storage, System Software, Communications, Databases, Computer Security and Safety, Ethics, and Privacy.

Course Outline:

1. Introduction to Computers: Data and Information, Information Processing Cycle, the Components of a Computer, Advantages and Disadvantages of Using Computers. Networks and the Internet. Computer Software, Categories of Computers, Elements of an Information System, Examples of Computer Usage, Computer Applications in Society [Ch. 1].
2. The Internet and World Wide Web: Key Concepts of the Internet, Evolution of the Internet, The World Wide Web, E-Commerce, Other Internet Services, Netiquette [Ch. 2].
3. Application Software: Business Software, Graphics and Multimedia Software, Software for Home, Personal, and Educational Use, Web Applications, Application Software for Communications. [Ch. 3]
4. The System Unit: Processor, Data Representation, Memory, Expansion Slots and Adapter Cards, Ports and Connectors, Buses, Bays, Power Supply. [Ch. 4]
5. Input Devices:What Is Input? What Are Input Devices? The Keyboard, Pointing Devices, Mouse, Other Pointing Devices, Touch Screens And Touch-Sensitive Pads, Pen Input. Other Input For Smart Phones, Game Controllers, Digital Cameras, Voice Input, Video Input, Scanners And Reading Devices, Biometric Input, Terminals, Putting It All Together, Input Devices For Physically Challenged Users. [Ch. 5]
6. Output Devices: What is Output? Display Devices, Printers, Speakers, Headphones, and Earbuds, Other Output Devices. [Ch. 6]
7. Storage: Hard Disks, Flash Memory Storage, Cloud Storage, Optical Discs, Other Types of Storage. [Ch. 7]
8. System Software: Operating Systems, Operating System Functions, Types Of Operating Systems, Stand-Alone Operating Systems, Server Operating Systems, Embedded Operating Systems, Utility Programs [Ch. 8]
9. Communications: Uses of Computer Communications, Networks, Network Communications Standards, Communications Software, Communications over the Telephone Network, Communications Devices, Home Networks, Communications Channel, Physical Transmission Media, Wireless Transmission Media. [Ch. 9]
10. Databases: Data, and Information, The Hierarchy of Data, Maintaining Data, File Processing Versus Databases, Database Management Systems, Relational, Object-Oriented, and Multidimensional Databases, Web Databases, Database Administration
11. Computer Security and Safety, Ethics, and Privacy:Computer Security Risks, Internet And Network Attacks, Unauthorized Access And Use, Hardware Theft And Vandalism,

Software Theft, Information Theft, System Failure, Backing Up, Wireless Security, Health Concerns Of Computer Use, Ethics And Society

Labs:

Lab work should be carried out to develop students' Computer Skills, Operating Systems and Utility Software Skills, E-Mail Skills, Word Processing Skills, Spreadsheet Skills, Electronic Presentation Skills, Web Surfing Skills.

Textbook(s):

- DiscoveringComputers by Gary B. Shelly & Misty E. Vermaat, Course Technology; 1st Edition (January 25, 2011).

Reference Material:

- Computing Essentials 2012 by Timothy J. O'Leary and Linda I. O'Leary, McGraw Hill Higher Education; 22nd Revised Edition (February 1, 2011).
- Computers: Understanding Technology by Fuller, Floyd; Larson, Brian, Fourth Edition, ISBN: 978-0-76383-927-7 (OR Latest Edition.)
- The Concepts of Information Technology by Imran Saeed, AfsanRaza, Tariq Mahmood and ZafarHussain, 6th Edition, IT Series Publications.
- The Essential Guide to Computing: The Story of Information Technology byby E Garrison Walters, Prentice Hall PTR (August 11, 2000). ISBN-10: 0130194697
- Computer Applications by Tasleem Mustafa, Tariq Mahmood, Imran Saeed and ZahidJaved, IT Publication Series

Course Title: Professional Practices
Course Code: SS-4910
Course Structure: Lectures: 3/ Labs: 0
Credit Hours: 3
Prerequisites: None

Course Objectives:

A Computing graduate as professional has some responsibilities with respect to the society. This course develops student understanding about historical, social, economic, ethical, and professional issues related to the discipline of Computing. It identifies key sources for information and opinion about professionalism and ethics. Students analyze, evaluate, and assess ethical and professional computing case studies.

Course Outline:

The Engineering Profession, The Structure of Organizations, Finance and Accounting, Anatomy of a Software House, Computer Contracts, Intellectual Property Rights, The Framework of Employee Relations Law and Changing Management Practices, Human Resource Management and Software Engineering, Health and Safety at Work, Software Liability, Liability and Practice,

Computer Misuse and the Criminal Law, Regulation and Control of Personal Information. Overview of the British Computer Society Code of Conduct, IEEE Code of Ethics, ACM Code of Ethics and Professional Conduct, ACM/IEEE Software Engineering Code of Ethics and Professional Practice.

Course Outline:

1. The Engineering Profession [TB: Ch. 1]
2. The Structure of Organizations [TB: Ch. 2]
3. Finance and Accounting [TB: Ch. 3]
4. Anatomy of a Software House [TB: Ch. 4]
5. Computer Contracts [TB: Ch. 5]
6. Intellectual Property Rights [TB: Ch. 6]
7. The Framework of Employee Relations Law and Changing Management Practices [TB: Ch. 7]
8. Human Resource Management and Software Engineering [TB: Ch. 8]
9. Health and Safety at Work [TB: Ch. 9]
10. Software Liability: Liability and Practice [TB: Ch. 10]
11. Computer Misuse and the Criminal Law [TB: Ch. 11]
12. Regulation and Control of Personal Information: Data Protection, Defamation and Related Issues [TB: Ch. 12]
13. The British Computer Society Code of Conduct [Online]
14. IEEE Code of Ethics [Online]
15. ACM Code of Ethics and Professional Conduct [Online]
16. ACM/IEEE Software Engineering Code of Ethics and Professional Practice [Online]

Textbook(s):

- Professional Issues in Software Engineering by Frank Bott, Allison Coleman, Jack Eaton and Diane Rowland, CRC Press; 3rd Edition (2000). ISBN-10: 0748409513
- Online Resources

Reference Material:

- A Gift of Fire: Social, Legal, and Ethical Issues for Computing and the Internet (3rd Edition) by Sara Baase, Prentice Hall; 3rd Edition (2008). ISBN-10: 0136008488
- Applied Professional Ethics by Gregory R. Beabout, University Press Of America (1993). ISBN-10: 0819193747.
- The Dark Side of Software Engineering: Evil on Computing Projects by Johann Rost and Robert L. Glass, Wiley-IEEE Computer Society Pr; 1st Edition (2011). ISBN-10: 0470597178
- Software Engineering Best Practices: Lessons from Successful Projects in the Top Companies by Capers Jones, McGraw-Hill Osborne Media; 1st Edition (2009). ISBN-10: 007162161X

Contents of Computing Supporting Area Elective Courses

1st Term

Course Title: Calculus and Analytical Geometry
Course Code: MATH-2213
Course Structure: Lectures: 3, Labs: 0
Credit Hours: 3
Prerequisites: None

Course Objectives:
To provide foundation and basic ground for calculus and analytical geometry background.

Course Syllabus:
Real Numbers and the Real Line. Functions. Shifting Graphs, Trigonometric Functions. Limits and Continuity. Tangent Lines. Derivatives. Differentiation Rules. Derivatives of Trigonometric Functions. The Chain Rule. Implicit Differentiation and Rational Exponents. Applications of Derivatives. Integration. Numerical Integration. Applications of Integrals. Transcendental Functions. Inverse Trigonomic Functions. Derivatives of Inverse Trigonometric Functions. Integrals. Hyperbolic Functions. Conic Sections, Parametrized Curves, and Polar Coordinates. Vectors and Analytic Geometry in Space.

Course Outline:

1. Real Numbers and the Real Line, Coordinates, Lines, and Increments, Functions, Shifting Graphs, Trigonometric Functions. [TB: Preliminaries]
2. Limits and Continuity: Rates of Change and Limits, Rules for Finding Limits, Target Values and Formal Definitions of Limits, Extensions of the Limit Concept, Continuity, Tangent Lines. [TB: Ch. 1]
3. Derivatives: The Derivative of a Function, Differentiation Rules, Rates of Change, Derivatives of Trigonometric Functions, The Chain Rule, Implicit Differentiation and Rational Exponents. [TB: Ch. 2]
4. Applications of Derivatives: Extreme Values of Functions, The Mean Value Theorem, The First Derivative Test for Local Extreme Values, Graphing with y' and y''. [TB: Ch. 3]
5. Integration: Indefinite Integrals, Integration by Substitution—Running the Chain Rule Backward, Estimating with Finite Sums, Riemann Sums and Definite Integrals, Properties, Area, and the Mean Value Theorem. Substitution in Definite Integrals. Numerical Integration. [TB: Ch. 4]
6. Applications of Integrals: Areas between Curves, Finding Volumes by Slicing, Volumes of Solids of Revolution—Disks and Washers. Cylindrical Shells. Lengths of Plan Curves. Areas of Surfaces of Revolution, Moments and Centers of Mass. [TB: Ch. 5]
7. Transcendental Functions: Inverse Functions and Their Derivatives, Natural Logarithms, The Exponential Function, a^x and $\log_a x$, Growth and Decay, L'Hôpital's Rule, Relative Rates of Growth, Inverse Trigonometric Functions, Derivatives of Inverse Trigonometric Functions; Integrals. Hyperbolic Functions. [TB: Ch. 6]
8. Conic Sections, Parameterized Curves, and Polar Coordinates: Conic Sections and Quadratic Equations. Classifying Conic Sections by Eccentricity. Quadratic Equations

and Rotations. Parameterizations of Plan Curves. Calculus with Parameterized Curves. Polar Coordinates. Graphing in Polar Coordinates. Polar Equations for Conic Sections. Integration in Polar Coordinates. [TB: Ch. 7, 9]

9. Vectors and Analytic Geometry in Space, Vectors in the Plane Dot Products, Vector-Valued Function Cartesian (Rectangular) Coordinates and Vectors in Space. Dot Products. Cross Products. Lines and Planes in Space. Cylinders and Quadric Surfaces. Cylindrical and Spherical Coordinates. [TB: Ch. 9, 10]

Textbook(s):

- Calculus and Analytic Geometry by George B. Thomas and Ross L. Finney, Addison Wesley; 10th Edition (1995) ISBN-10: 0201531747

Reference Material:

- Calculus and Analytical Geometry by Swokowski, Olinick and Pence, 6th Edition, (1994), Brooks/Cole Publishers.
- Calculus by Howard Anton, Irl C. Bivens, Stephen Davis, Wiley; 10th Edition (2012), ISBN-10: 0470647728
- Calculus with Analytic Geometry: Student Solution Manual by Howard Anton, Wiley; 5th Edition (1995). ISBN-10: 0471105899

Course Title: Probability and Statistics
Course Code: MATH-2110
Course Structure: Lectures: 3/ Labs: 0
Credit Hours: 3
Prerequisites: None

3rd Term

Course Objectives:

To introduce the concepts of data analysis, presentation, counting techniques, probability and decision making.

Course Syllabus:

Statistics and Data Analysis.Collection of Data.Measures of Location.Measures of Variability.Discrete and Continuous Data.Statistical Modeling. Scientific Inspection, and Graphical, General Types of Statistical Studies. Probability.Random Variables and Probability Distributions.Mathematical Expectation.Discrete Probability Distributions.Continuous Probability Distributions.Fundamental Sampling Distributions and Data Descriptions.One- and Two-Sample Estimation Problems.Single Sample Estimating.One- and Two-Sample Tests of Hypotheses. Sample Tests. Simple Linear Regression and Correlation.Multiple Linear Regression and Certain.

Course Outline:

1. Introduction to Statistics and Data Analysis: Statistical Inference, Samples, Populations, and the Role of Probability, Sampling Procedures; Collection of Data, Measures of Location: The Sample Mean and Median, Measures of Variability, Discrete and Continuous Data, Statistical Modeling, Scientific Inspection, and Graphical, General

Types of Statistical Studies: Designed Experiment, Observational Study, and Retrospective Study. [TB: Ch. 1]

2. Probability: Sample Space, Events, Counting Sample Points, Probability of an Event, Additive Rules, Conditional Probability, Independence, and the Product Rule, Bayes' Rule. [TB: Ch. 2]
3. Random Variables and Probability Distributions: Concept of a Random Variable, Discrete Probability Distributions, Continuous Probability Distributions, Joint Probability Distributions. [TB: Ch. 3]
4. Mathematical Expectation: Mean of a Random Variable, Variance and Covariance of Random Variables, Means and Variances of Linear Combinations of Random Variables, Chebyshev's Theorem. [TB: Ch. 4]
5. Discrete Probability Distributions: Binomial and Multinomial Distributions, Hypergeometric Distribution, Negative Binomial and Geometric Distributions, Poisson Distribution and the Poisson Process. [TB: Ch. 5]
6. Continuous Probability Distributions: Continuous Uniform Distribution, Normal Distribution, Areas under the Normal Curve, Applications of the Normal Distribution, Normal Approximation to the Binomial, Gamma and Exponential Distributions, Chi-Squared Distribution, Beta Distribution. [TB: Ch. 6]
7. Fundamental Sampling Distributions and Data Descriptions: Random Sampling, Sampling Distributions, Sampling Distribution of Means and the Central Limit Theorem. Sampling Distribution of S2, t-Distribution, F-Quantile and Probability Plots. [TB: Ch. 8]
8. One- and Two-Sample Estimation Problems: Introduction, Statistical Inference, Classical Methods of Single Sample: Estimating the Mean, Standard Error of a Point, Prediction Intervals, Tolerance Limits, Estimating the Difference between Two Means. [TB: Ch. 9]
9. Single Sample: Estimating a Proportion, Estimating the Difference between Two Proportions, Single Sample: Estimating the Variance, Estimating the Ratio of Two Variances. [TB: Ch. 9]
10. One- and Two-Sample Tests of Hypotheses: Statistical Hypotheses: General Concepts, Testing a Statistical Hypothesis, The Use of P-Values for Decision Making in Testing Hypotheses. [TB: Ch. 10]
11. Single Sample: Tests Concerning a Single Mean, Two Samples: Tests on Two Means, Choice of Sample Size for Testing Means, Graphical Methods for Comparing Means, One Sample: Test on a Single Proportion, Two Samples: Tests on Two Proportions. [TB: Ch. 10]
12. One- and Two-Sample Tests Concerning Variances, Goodness-of-Fit Test, Test for Independence (Categorical Data), Test for Homogeneity [TB: Ch. 10]
13. Simple Linear Regression and Correlation: Introduction to Linear Regression, The Simple Linear Regression Model, Least Squares and the Fitted Model, Properties of the Least Squares Estimators. [TB: Ch. 11]
14. Multiple Linear Regression and Certain: Nonlinear Regression Models, Introduction, Estimating the Coefficients, Linear Regression Model Using Matrices, Properties of the Least Squares Estimators. [TB: Ch. 12]

Textbook(s):

- Probability and Statistics for Engineers and Scientists by Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers and Keying E. Ye, Pearson; 9th Edition (January 6, 2011). ISBN-10: 0321629116

Reference Material:

- Probability and Statistics for Engineers and Scientists by Anthony J. Hayter, Duxbury Press; 3rd Edition (February 3, 2006), ISBN-10: 0495107573
- Schaum's Outline of Probability and Statistics, by John Schiller, R. AluSrinivasan and Murray Spiegel, McGraw-Hill; 3rd Edition (2008). ISBN-10: 0071544259
- Probability: A Very Short Introduction by John Haigh, Oxford University Press (2012). ISBN-10: 0199588481

Course Title: Linear Algebra

Course Code: MATH-3215
Course Structure: Lectures: 3, Labs: 0
Credit Hours: 3
Prerequisites:None

4th Term

Course Objectives:

To provide fundamentals of solution for system of linear equations, operations on system of equations, matrix properties, solutions and study of their properties.

Course Syllabus:

Introduction to Vectors. Solving Linear Equations. Elimination = Factorization. Vector Spaces and Subspaces. Orthogonally. Determinants. Eigenvalues and Eigenvectors. Graphs and Networks, Markov Matrices, Population, and Economics. Linear Programming. Fourier series. Linear Algebra for Functions, Linear Algebra for Statistics and Probability, Computer Graphics. Numerical Linear Algebra. Complex Vectors and Matrices. Discrete Transforms and Simple Applications.

Course Outline:

1. Introduction to Vectors: Vectors and Linear Combinations, Lengths and Dot Products, Matrices. [TB1: Ch. 1]
2. Solving Linear Equations: Vectors and Linear Equations, the Idea of Elimination, Elimination Using Matrices, Rules for Matrix Operations, Inverse Matrices. [TB1: Ch. 2]
3. Elimination = Factorization; A = LU, Transposes and Permutations
4. Vector Spaces and Subspaces: Spaces of Vectors, The Null space of A: Solving Ax = 0, The Rank and the Row Reduced Form, the Complete Solution to Ax = B, Independence, Basis and Dimension, Dimensions of the Four Subspaces. [TB1: Ch. 3]
5. Orthogonally: Orthogonally of the Four Subspaces, Projections, Least Squares Approximations, Orthogonal Bases and Gram-Schmidt. [TB1: Ch. 4]
6. Determinants: The Properties of Determinants, Permutations and Cofactors, Cramer's Rule, Inverses, and Volumes. [TB1: Ch. 5]
7. Eigenvalues and Eigenvectors: Introduction to Eigenvalues, Diagonalizing a Matrix, Applications to Differential Equations, Symmetric Matrices, Positive Definite Matrices, Similar Matrices, Singular Value Decomposition (SVD). [TB1: Ch. 6]
8. Applications: Matrices in Engineering, Graphs and Networks, Markov Matrices, Population, and Economics; Linear Programming, Fourier series: Linear Algebra for Functions, Linear Algebra for Statistics and Probability, Computer Graphics.
9. Numerical Linear Algebra: Gaussian Elimination in Practice, Norms and Condition

Numbers, Iterative Methods for Linear Algebra. [TB1: Ch. 9]

10. Complex Vectors and Matrices: Complex Numbers, Hermitian and Unitary Matrices. Matrix Factorizations. [TB1: Ch. 10]

Textbook(s):

- Introduction to Linear Algebra by Gilbert Strang, Wellesley Cambridge Press; 4th Edition (February 10, 2009). ISBN-10: 0980232716

Reference Material:

- Elementary Linear Algebra with Applications by Bernard Kolman, David Hill, 9th Edition, Prentice Hall PTR, 2007. ISBN-10: 0132296543
- Strang's Linear Algebra And Its Applications by Gilbert Strang, Strang, Brett Coonley, Andy Bulman-Fleming, Andrew Bulman-Fleming, 4th Edition, Brooks/Cole, 2005
- Elementary Linear Algebra: Applications Version by Howard Anton, Chris Rorres, 9th Edition, Wiley, 2005.
- Linear Algebra and Its Applications by David C. Lay, 2nd Edition, Addison-Wesley, 2000.
- Linear Algebra by Harold M. Edwards, Birkhäuser; 1st Edition (2004). ISBN-10: 0817643702
- Linear Algebra: A Modern Introduction by David Poole by Brooks Cole; 3rd Edition (May 25, 2010).ISBN-10: 0538735457

Course Title: Basic Electronics
Course Code: PHY-2210
Course Structure: Lectures: 3 / Labs: 0
Credit Hours: 3
Prerequisites: None

LT Texas

Course Syllabus:

Zero Reference Level, Chassis Ground, Ohm's Law, Linear Resistor, Non Linear Resistor, Cells in Series and Parallel. Resistive Circuits.Resistors, Inductors, Capacitors, Energy Sources.Magnetism and Electromagnetism.Theory of Solid State.P-N Junction. Forward Biased P-N Junction, Forward V/I Characteristics, Reverse Biased P-N Junction, Reverse Saturation Current, Reverse V/I Characteristics, Junction Breakdown, Junction Capacitance. Optoelectronics Devices. Spectral Response of Human Eye, Light Emitting Diode (LED), Photoemissive Devices, Photomultiplier Tube, Photovoltaic Devices, Bulk Type Photoconductive Cells, Photodiodes, P-N Junction Photodiode, PIN Photodiode, and Avalanche Photodiode. DC Power Supplies.Rectifiers. Filters, Voltage Multipliers, Silicon Controlled Rectifier SCR. The Basic Transistor.Transistor Biasing, Transistor Circuit Configuration.Modulation and Demodulation. Carrier Waves, Modulation, Demodulation Or Detection.Integrated Circuits.Operational Amplifier.Fiber Optics.

Course Outline:

1. Zero Reference Level, Chassis Ground, Ohm's Law, Formula Variations of Ohm's Law,

Graphical Representation of Ohm's Law, Linear Resistor, Non Linear Resistor, Cells in Series and Parallel.[Ch 1]

2. Resistive Circuits. [Ch 2]
3. Resistors(5.1-15), Inductors(5.19-21) Capacitors(5.35-48) .[Ch 5]
4. Energy Sources. [Ch 6]
5. Magnetism and electromagnetism [Ch 7].
6. Solid State. Atomic structure, Electron distribution of different atoms, Energy bands in solids, Bonds in solids, Conduction in solids, Conductors, Semiconductors and types of semiconductors, Insulators, Majority and Minority charge carriers, Mobile charge carriers and immobile ions, Drift current in good conductors.[Ch 12]
7. P-N Junction. Formation of depletion layer, Junction or barrier voltage, Forward biased P-N Junction, Forward V/I Characteristics, Reverse biased P-N Junction, Reverse Saturation Current, Reverse V/I Characteristics, Junction breakdown, Junction Capacitance. [Ch 13]
8. Optoelectronics Devices. Spectral response of human eye, Light Emitting Diode (LED), Photoemissive Devices, Photomultiplier Tube, Photovoltaic Devices, Bulk type Photoconductive cells, Photodiodes, P-N junction Photodiode, PIN Photodiode, and Avalanche Photodiode. [Ch 16]
9. DC Power Supplies. Unregulated and Regulated Power Supply, Steady and Pulsating DC Voltages, Rectifiers (17.5-17.8), Filters (17.9-17.2), Voltage Multipliers (17.24-17.30), Silicon Controlled Rectifier SCR(17.33-17.37)[Ch 17]
10. The Basic Transistor. Transistor Biasing, Transistor Circuit Configuration. [Ch 18]
11. Modulation and Demodulation. Carrier Waves, Modulation, Demodulation or Detection, Comparison between Amplitude Modulation (AM) and Frequency Modulation (FM). [Ch 30]
12. Integrated Circuits. Advantages of ICs and Drawbacks of ICs, Scale of Integration. Classification of ICs by function, Linear and Digital Integrated Circuits, IC Terminology, Fabrication of IC Components, Popular Application of ICs, Operational Amplifier. [Ch 31]
13. Fiber Optics. Structure of Optical Fibers, Classification of Optical Fiber, fiber Characteristics, Choice of Wavelength, Optical Fiber cable, Application of fiber Optic Communication. [Ch 38]

Textbook(s):

- Basic Electronics Solid State by B. L. Theraja, S Chand & Co Ltd, 5th Edition, 2007, ISBN-13: 978-8121925563

Reference Material:

- Electronic Principles by Albert Paul Malvino, Sixth Edition, 1999, ISBN 0-07-115604-6

Contents of SE-Supporting Elective Courses

Course Title: Object Oriented Analysis and Design
Course Code: SE-3311
Course Structure: Lectures: 3/Labs: 0
Credit Hours: 3

Prerequisites: CMP-2123 (Object Oriented Programming)

Course Objectives:

In this course, the students will learn how to produce detailed object models and designs from system requirements; use the modeling concepts provided by UML; identify use cases and expand into full behavioral designs; expand the analysis into a design ready for implementation and construct designs that are reliable.

Course Syllabus:

Principles of Object Technology. UML Unification, UML Diagrams, Unified Process & Rational Unified Process, RUP Disciplines, Requirements Types, Use Case Modeling. EBP Guidelines.System Use Case Diagram, Use Case Table, Activity Diagram, Supplementary Specifications, Vision Document, Glossary, Rational Rose Overview.Elaboration Phase of RUP; Configuration Management; System Sequence Diagram, Domain Model.Implementation of System Sequence & Domain Model. Use Case Dependencies. Analysis Use Case Diagram, Implementation of Sequence, Collaboration, Analysis Use Case Diagram.State Chart Diagrams and Implementation. Design Patterns. Use Case Realization Using GRASP Patterns, Design Model. Modeling Generalization, Creating Design Class Diagram, Mapping Data Model to Domain Model.Implementation of Design Class Diagram, Coding patterns, Mapping Design to Code.Patterns for Assigning Responsibilities, Polymorphism, Pure Fabrication, Indirection, Protected Variation.GoF Design Patterns. [Students must be introduced with Object Diagram, Component Diagram, Package Diagram, Deployment Diagram, Network Diagram.]

Course Outline:

1. Principles of Object Technology: Introduction to Object Technology, Principles of Modeling, and Principles of Object Orientation [TB: Ch. 1.1-5]
2. Introduction to UML, Unification, UML Diagrams, Unified Process & Rational Unified Process, RUP Disciplines, Case Study Analysis and Basics, Case Study, About Inception. Feasibility and Risk Analysis [TB: Ch. 1.6, 2.1-6, 3.1-2,4.1-3]
3. Understanding Requirements, Requirements Types, Use Case Modeling: Use Case Writing Styles, EBP Guidelines [TB: Ch. 5.1, 6.1-8]
4. System Use Case Diagram, Use Case Table, Activity Diagram, Supplementary Specifications, Vision Document, Glossary, Rational Rose Overview, Use Case & Activity Diagram Modeling in Rational Rose [TB: Ch. 6.9, 6.12-17, 7.2-4 & 7]
5. Elaboration Phase of RUP; Configuration Management; System Sequence Diagram, Domain Model : Identifying Business Classes, Associations, Attributes [TB: Ch.8.2-5,9.2-4,10.1-4,11.1-7,12.1-4]
6. Implementation of System Sequence & Domain Model: Use Case Operational Contracts, Business Sequence, Analysis Sequence & Collaboration Diagrams [TB: Ch. 11.10, 12.9, 13.1-2, 13.9, 15.1-7]
7. Use Case Dependencies. Analysis Use Case Diagram, Implementation of Sequence, Collaboration, Analysis Use Case Diagram [TB: Ch. 25.1-5, 15.6-7]
8. State Chart Diagrams and Implementation [TB: Ch. 29.1-5, 29.8, Ch. 1-13, 25, 29]
9. Design Patterns: GRASP: Information Expert, Creator, Cohesion & Coupling, Controller [Ch. 16.1-10]
10. Use Case Realization Using GRASP Patterns, Design Model: Determining Visibility [TB: Ch. 17.1-9, 18.1-3]
11. Modeling Generalization, Creating Design Class Diagram, Mapping Data Model to

Domain Model [TB: Ch. 26.1-7, 27.1-10, 19.1-6, 34.5-9]

12. Implementation of Design Class Diagram, Coding patterns, Mapping Design to Code [TB: Ch. 19.6, 20.1-11]
13. More Patterns for Assigning Responsibilities, Polymorphism, Pure Fabrication, Indirection, Protected Variation. GoF Design Patterns: Adapter, Factory [TB: Ch. 22.1-4, 23:1-2]
14. Gof: Singleton, Strategy, Composition, Façade and Discuss Remaining Patterns [TB: Ch. 23.4-8]

Note: [Students must be introduced with Object Diagram, Component Diagram, Package Diagram, Deployment Diagram, Network Diagram.]

Textbook(s):

- Applying UML and patterns: An introduction to Object-Oriented Analysis and Design and Iterative Development by Craig Larman, Prentice Hall; 3rd Edition (October 30, 2004). ISBN-10: 0131489062

Reference Material:

- Fundamental of Object-Oriented Design in UML by Meiler Page-Jones, Addison Wesley. 2000. ISBN: 020169946X.
- The Unified Modeling Language User Guide by G. Booch, J. Rambaugh and I. Jakobson, Addison-Wesley Professional; 2nd Edition (2005). ISBN-10: 0321267974.
- The Unified Modeling Language Reference Manual by James Rumbaugh, Ivar Jacobson and Grady Booch, Addison-Wesley Professional; 2nd Edition (2004). ISBN-10: 032171895X.
- The Unified Modeling Language User Guide by Grady Booch, James Rumbaugh and Ivar Jacobson, Addison-Wesley Professional; (2005). ISBN-10: 0321267974.
- Visual Modeling with Rational Rose 2000 and UML by Terry Quatrani, Addison Wesley. 2000. ISBN: 0201699613.
- The Rational Unified Process Made Easy: A Practitioner's Guide to the RUP: A Practitioner's Guide to the RUP by Per Kroll, Philippe Kruchten and Grady Booch, Addison-Wesley Professional (2003). ISBN-10: 0321166094.
- The Rational Unified Process: An Introduction by Philippe B. Kruchten, Addison-Wesley Professional; 3rd Edition (2003). ISBN-10: 0321197704.

Course Title: Artificial Intelligence
Course Code: CS-3811
Course Structure: Lectures: 3/Labs: 0
Credit Hours: 3
Prerequisites: CMP-2111(Discrete Structures)
Course Objectives:

This course will introduce the basic principles in artificial intelligence. It will cover simple representation schemes, problem solving paradigms, constraint propagation, and search strategies. Areas of application such as knowledge representation, natural language processing, expert systems, vision and robotics will be explored. The Prolog programming language will also

be introduced.

Course Syllabus:

What is AI, Foundations of AI, History of AI. Weak AI, Strong AI. Intelligent Agents: Agents and Environments, The Nature of Environments, The Structure of Agents. Problem Solving by Searching. Breadth-First Search, Depth-First Search, Depth-limited Search, Iterative Deepening, Depth-first Search, Comparison of Uninformed Search Strategies. Informed Search and Exploration. Constraint Satisfaction Problems. Reasoning and Knowledge Representation. Inference in First-Order Logic. Introduction to Prolog Programming. Reasoning Systems for Categories. Reasoning with Uncertainty & Probabilistic Reasoning. Representing Knowledge in an Uncertain Domain. Learning from Observations. Knowledge in Learning. Statistical Learning, Neural Networks.

Course Outline:

1. Introduction: What is AI, Foundations of AI, History of AI. Intelligent Agents: Agents and Environments, The Nature of Environments, The Structure of Agents [TB: Ch. 1, 2]
2. Problem Solving by Searching: Problem Solving Agents, Searching for Solutions, Uninformed Search Strategies:
3. Breadth-First Search, Depth-First Search, Depth-limited Search, Iterative Deepening, Depth-first Search, Comparison of Uninformed Search Strategies. [TB: Ch. 3]
4. Informed Search and Exploration: Informed (Heuristic) Search Strategies: Greedy Best-first Search, A* Search, Heuristic Functions, Local Search Algorithms and Optimization Problems. [TB: Ch. 4]
5. Constraint Satisfaction Problems: Backtracking Search for CSPs, Local Search for CSPs. Adversarial Search: Games, Minimax Algorithm, Alpha-Beta Pruning. [TB: Ch. 5, 6]
6. Reasoning and Knowledge Representation: Introductions to Reasoning and Knowledge Representation, Propositional Logic, First Order Logic: Syntax and Semantics of First-Order Logic, Knowledge Engineering in First-Order Logic, [TB: Ch. 7, 8]
7. Inference in First-Order Logic: Inference rules for quantifiers, A first-order inference rule, Unification, Forward Chaining, Backward Chaining, A backward chaining algorithm, Logic programming, The resolution inference rule [TB: Ch. 9]
8. Introduction to Prolog Programming
9. Reasoning Systems for Categories, Semantic Nets and Description logics, Reasoning with Default Information: Open and closed worlds, Negation as failure and stable model semantic. Truth Maintenance Systems [TB: Ch. 10]
10. Reasoning with Uncertainty & Probabilistic Reasoning : Acting Under Uncertainty, Bayes' Rule and Its Use, [TB: Ch 13]
11. Representing Knowledge in an Uncertain Domain, The Semantics of Bayesian Networks. [TB: Ch. 14]
12. Learning from Observations: Forms of Learning , Inductive Learning,, Learning Decision Trees [TB: Ch. 18]
13. Knowledge in Learning, Explanation-Based Learning, Inductive Logic Programming. [TB: 19]
14. Statistical Learning, Neural Networks, [TB: Ch. 20]
15. Philosophical Foundations: Weak AI, Strong AI, The Ethics and Risks of Developing

Artificial Intelligence [TB: Ch. 26]

Textbook(s):

- Artificial Intelligence: A Modern Approach, by Russell and Norvig, Prentice Hall. 2nd Edition. ISBN-10: 0137903952

Reference Material:

- Artificial Intelligence: A Systems Approach by M. Tim Jones, Jones and Bartlett Publishers, Inc; 1st Edition (December 26, 2008). ISBN-10: 0763773379
- Artificial Intelligence in the 21st Century by Stephen Lucci , Danny Kopec, Mercury Learning and Information (May 18, 2012). ISBN-10: 1936420236

Course Title: Software Engineering Economics
Course Code: SE-4342
Course Structure: Lectures: 3/Labs: 0
Credit Hours:3
Prerequisites: CMP-3310 (Software Engineering)

Course Objective:
The course is aimed to develop students' software cost estimation skills using industry standards.

Course Syllabus:
The Software Life-Cycle.The Waterfall Model.The Software Work Breakdown Structure (WBS) Software Maintenance.The Basic COCOMO Model.Development Modes.Model-Product Level Estimates.Performance Models & Cost Effectiveness Models.Decision Criteria.Present vs. Future Expenditure & Income - Cost Analysis.Goals as Constraints.Coping with Un-reconcilable & Un-quantified Goals.Detailed COCOMO. Detailed COCOMO Cost Drivers. Detailed COCOMO Cost Drivers-Personal Attributes: ACAP, AEXP, PCAP, VEXP, LEXP. Detailed COCOMO Cost Drivers: Project Attributes–Modern Programming Practices, Use of Software Tools, Schedule Constraint.

Course Outline:

1. The Software Life-Cycle: The Waterfall Model, Economic Rationale for the WM, Refinements of the WM, Life-Cycle Phase/Activity, The Software Work Breakdown Structure (WBS) Software Maintenance. The Basic COCOMO Model: Introduction, Definitions & Assumptions, Development Effort & Schedule, Phase Distribution, Nominal Project Profiles, The Rayleigh Distribution, Interpolation, Basic Software Maintenance Effort Estimation [TB: Ch. 4, 5]
2. Development Modes: Introduction, Basic Effort & Schedule Equations, COCOMO Modes of Software Development, COCOMO Effort & Schedule Equations, Phase Distribution of Effort & Schedule. Activity Distribution. Limitations of Basic COCOMO [TB: Ch. 6, 7]
3. Model-Product Level Estimates: Introduction, Software Development Effort Estimation,

Estimate of Annual Maintenance, Interpolation & Extrapolation, Estimating the Effects of Adapting Existing Software, Intermediate COCOMO Effort Equations. Component Level Estimation: Introduction, the Component Level Estimating Form (CLEF), Using CLEF with Adapted Software. [TB: Ch. 8, 9]

4. Performance Models & Cost Effectiveness Models: Performance Models, Optimal Performance, Sensitivity Analysis, Cost Effectiveness Models. Economies of Scale: Discrete Production Functions, Basic Production Functions, Economies & Diseconomies of Scale, Diseconomies of Scale on Large Software Projects. [TB: Ch. 10, 11]
5. Decision Criteria: Minimum Available Budget, Minimum Performance Requirement, Maximum Effectiveness-Cost Ratio, Maximum Effectiveness-Cost Difference, Composite Options. Net Value & Marginal Analysis. [TB: Ch. 12,13]
6. Cost Analysis, Interest Calculation, Present Value Calculation, Value of a Series of Cash Flows, Present Value Characteristics, Sensitivity to Interest Rate or Discount Rate, Applications to SE. Figures of Merit: Software Package Selection, Net Value Analysis, Figure of Merit Analysis, A Weighted Sum Analysis for Hardware & Software Selection. [TB: Ch. 14, 15]
7. Goals as Constraints: System Reliability & Availability, Figure of Merit Evaluation, Expressing Goals as Constraints, Goals as Constraints: Feasible Sets & Cost Value Contours, Decision Problems with Constraints, SE Applications, Mathematical Optimization Techniques, Capabilities& Limitation of Mathematical Optimization Techniques. Systems Analysis & Constrained Optimization (TB: Ch 16, 17)
8. Coping with Un-reconcilable & Un-quantified Goals: In-House vs. Vendor Development, Presentation Methods, Unquantifiable Criteria, Presentation Techniques for Unquantifiable Criteria, Presenting & Interpreting Multivariate Data. Coping with Uncertainties: Decision Rules for Complete Uncertainty, Subjective Probabilities, Decision Rules Under Complete Uncertainty, The Value of Information, Subjective Probabilities, Utility Functions, SE Implications. [TB: Ch 18, 19]
9. Detailed COCOMO: Summary & Operational Description: The Software Hierarchy Estimating Form & Procedures, Detailed COCOMO Example, Schedule Adjustment Calculations. Detailed COCOMO Cost Drivers: Product Attributes –Required Software Reliability, Data base Size, Software Product Complexity [TB: Ch. 23, 24]
10. Detailed COCOMO Cost Drivers: Computer Attributes –Execution Time, Main Storage Constraint, Virtual Machine Volatility, Computer Turn Around Time [TB: Ch 25]
11. Detailed COCOMO Cost Drivers-Personal Attributes: ACAP, AEXP, PCAP, VEXP, LEXP. [TB: Ch. 26]
12. Detailed COCOMO Cost Drivers: Project Attributes–Modern Programming Practices, Use of Software Tools, Schedule Constraint [TB: Ch 27]

Reference Material:

- Software Engineering Economics by Boehm, Prentice Hall, 1981.ISBN-10: 0138221227.

Reference Books:

- Estimating Software Costs: Bringing Realism to Estimating by Capers Jones, McGraw-Hill Osborne Media; 2nd Edition (April 19, 2007).ISBN-10: 0071483004
- Software Cost Estimation with COCOMO II by Barry W. Boehm, Chris Abts, A. Winsor Brown and SunitaChulani, Prentice Hall (August 11, 2000). ISBN-10: 0130266922.

- Software Cost Estimation and Sizing Methods, Issues, and Guidelines by Shari Lawrence Pfleeger, Rand Publishing (September 13, 2005). ISBN-10: 0833037137.
  Software Engineering Economics and Declining Budgets by Pamela T. Geriner, Thomas R. Gulledge, William P. Hutzler, Springer London, Limited, (31-Jul-2012)

Course Title: Web Systems and Technologies
Course Code: IT-3548
Course Structure: Lectures: 3 / Labs: 0
Credit Hours: 3
Prerequisites: CMP-2122 (Programming Fundamentals)
Course Objectives:
To introduce students with Web Systems and Technologies.

5th Term

Course Syllabus:
Overview of WWW, Web Pages, Web Sites, Web Applications, TCP/IP, TCP/IP Application, Services, Web Servers, WAMP Configuration. Introduction to HTTP, HTML & HTML5 Tags, and Dynamic Web Content.CSS and CSS3. Client Side Programming: JavaScript: Basics, Expressions and Control Flow, Functions, Objects, and Arrays, Accessing CSS from JavaScript. Form Handling. Server Side Programing: Programing in PHP.Introduction MySQL, MySQL Functions, Accessing MySQL via phpMyAdmin. Cookies, Sessions, and Authentication.Introduction to XML, Ajax, JQuery, Browsers and the DOM. Designing a Social Networking Site.

Course Outline:
1 Overview of WWW, Web Pages, Web Sites, Web Applications, TCP/IP, TCP/IP Application, Services, Web Servers, WAMP Configuration.
2 Introduction to HTTP, HTML & HTML5 Tags, and Dynamic Web Content.[Ch. 1]
3 CSS and CSS3 [Ch. 18,19]
4 Client Side Programming: Programing in JavaScript: Basics, Expressions and Control Flow, Functions, Objects, and Arrays, Accessing CSS from JavaScript [Ch. 13, 14, 15, 20]
5 Form Handling [Ch. 11]
6 Server Side Programing: Programing in PHP, [Ch. 3, 4,5,6]
7 Introduction MySQL, MySQL Functions, Accessing MySQL via phpMyAdmin,
8 Cookies, Sessions, and Authentication [Ch. 12]
9 Introduction to Ajax, JQuery,Browsers and the DOM [W3 Schools Tutorial]
10 Designing a Social Networking Site [Ch. 21]

Textbook(s):
- Learning PHP, MySQL, JavaScript, and CSS, A Step-by-Step Guide to Creating Dynamic Websites By Robin Nixon, O'Reilly Media; Second Edition edition (September 3, 2012). ISBN-10: 1449319262

Reference Material:

- Web Technologies: A Computer Science Perspective by Jeffrey C. Jackson, Prentice Hall; 1st Edition (August 27, 2006). ISBN-10: 0131856030
- Web Technologies by Uttam Kumar Roy, Oxford University Press, USA (June 13, 2011). ISBN-10: 0198066228
- Web Application Architecture: Principles, protocols and practices by Leon Shklar and Richard Rosen, Wiley; 2nd Edition (May 5, 2009). ISBN-10: 047051860X

Contents of GE/University Elective Courses

Course Title: Principles of Management
Course Code: MNG-2212
Course Structure: Lectures: 3 / Labs: 0
Credit Hours: 3
Prerequisites: None

2nd Term

Course Objectives:
The course will cover topics fundamentals and principles of management, administrative police, objectives, and procedures and problems of organizational control and leadership.

Course Syllabus:
Introduction to Managers and Management.Organizational Culture and Environment. Decision Making The Essence of Manager's Job. Planning.Organization Structure and Design.Motivation.Leadership.Communication. Controlling - Foundations of Control. The Personnel Function.Job Design and Analysis.Human Resource Planning.Recruitment and Selections/Testing and Interview.Union and Management, Compensation Administration, Health and Safety.

Course Outline:
1. Introduction to Managers and Management: What as Management and What Do Managers Do? Defining Management, Management Functions, Management Roles, Management Skills, History of Management.[TB2: Ch. 1]
2. Organizational Culture and Environment: The Manager: Omnipotent or Symbolic? The Organization's Culture, The Environment - Defining Environment, The Specific Environment, The General Environment, Influence on Management Practice. [TB1: Ch. 3]
3. Decision Making The Essence of Manager's Job: The Decision Making Process, The Rational Decision Maker, Decision Making Styles, Analyzing Decision Alternatives Certainty, Risk, Uncertainty. [TB1: Ch. 6]
4. Planning: The Foundations of Planning, The Definition of Planning, Purposes of Planning, Types of Plans, Contingency Factors on Planning, Objectives: The Foundation for Planning, Multiplicity of Objectives, Real Versus Stated Objectives, Traditional Objective Setting, Management by Objectives. [TB2: Ch. 3]
5. Organization Structure and Design: Defining Organization Structure and Design, Building, The Vertical Dimension of Organizations, Building the Horizontal Dimension

of Organizations, The Contingency Approach to Organization Design, Application of Organization Design.

6. Motivation: Motivating Employees, What is Motivation? Contemporary Approaches to Motivation, Contemporary Issues in Motivation, From Theory to Practice: Suggestions for Motivating Employees. [TB2: Ch. 10]
7. Leadership: Managers Verses Leaders, Trait Theories, Behavioral Theories, Contingency Theories, Emerging Approaches to Leadership, Contemporary Issues in Leadership. [TB2: Ch. 11]
8. Communication: Communication and Interpersonal Skills, Understanding Communication, Communication Styles of Men And Women, Feedback Skills, Delegation Skills', Conflict Management Skills, Negotiation Skills [TB2: Ch. 12]
9. Controlling - Foundations of Control: What is Control? The Importance of Control, The Control Process, Types of Control, Qualities of Effective Control, The Dysfunctional Side of Control, Ethical Issues in Control; Controlling Tools and Techniques: Information Controls, Financial Controls, Operations Controls, Behavioral Controls. [TB2: Ch. 13]
10. The Personnel Function: Terminology, Who Does Personnel Work? Staff Role of The Personnel Department Personnel (Human Resource) Functions. [TB3: Ch. 1 & 2]
11. Job Design and Analysis: Job Design, Job Information and Personnel Management, Analyzing Jobs-Obtaining Job Information, Functional Job Analysis, Administration of The Job Analysis Program. [TB3: Ch. 6 & 7]
12. Human Resource Planning: Reasons for Human Resource Planning, The Planning Process. [TB3: Ch. 5]
13. Recruitment and Selections/Testing and Interview: Labor Market Considerations, Recruitment and Selection Policy Issues, The Employment Process, Sources of People, The Selection Process, The Selection Procedure, Testing: Interview. [TB3: Ch. 6 & 7]
14. Miscellaneous: Union and Management, Compensation Administration, Health And Safety [TB2: Ch. 15, 17 & 18]

Textbook(s)

1. Management by Robbins, S.P. & Coulter, Mary, Prentice Hall; 10th Edition (November 3, 2008). ISBN-10: 0132090716
2. Fundamentals of Management by Robbins, S.P. &DeCenzo, David A, Prentice Hall; 7th Edition (January 13, 2010). ISBN-13: 978-0132090711
3. Human Resource Management by David A. DeCenzo and Stephen P. Robbins. Wiley; 7th Edition (October 10, 2001). ISBN-10: 0471397857

Reference Material:

- Principles of Management by Charles W. L. Hill and Steven McShane, McGraw-Hill/Irwin; 1st Edition (2006). ISBN-10: 0073530123
- Principles of Management by Mason Carpenter, Flat World Knowledge, Inc. (2009). ISBN-10: 0982043074
- Management by Richard L. Daft, South-Western College Pub; 10th Edition (January 27, 2011). ISBN-10: 0538479531
- Fundamentals of Management by Stephen P. Robbins, David A. DeCenzo and Mary Coulter, Prentice Hall; 7th Edition (January 13, 2010). ISBN-10: 0136109829

Course Title: Human Resource Management
Course Code: MNG-2215
Course Structure: Lectures: 3 / Labs: 0
Credit Hours: 3
Prerequisites: None

Course Objectives:
After successfully completing of this course, students will be able to understand the core aspects of Human Resource Management required in 21st Century organizations.

Course Syllabus:
Managing Human Resources, Understanding the External and Organizational Environments, Ensuring Fair Treatment and Legal Compliance, HR Planning for Alignment and Change, Using Job Analysis and Competency Modeling, Recruiting and Retaining Qualified Employees, Selecting Employees to Fit the Job and the Organization, Training and Developing a Competitive Workforce, Conducting Performance Management, Developing an Approach to Total Compensation, Using Performance-Based Pay to Achieve Strategic Objectives, Providing Benefits and Services for Employees' Well-Being, Risk Management, Employee Relations, and Risk Management, Health, Safety, and Employee Well-Being, Understanding Unionization and Collective Bargaining.

Course Outline:
1. Managing Human Resources. [TB: Ch. 1]
2. Understanding the External and Organizational Environments. [TB: Ch. 2]
3. Ensuring Fair Treatment and Legal Compliance. [TB: Ch. 3]
4. HR Planning for Alignment and Change. [TB: Ch. 4]
5. Using Job Analysis and Competency Modeling. [TB: Ch. 5]
6. Recruiting and Retaining Qualified Employees. [TB: Ch. 6]
7. Selecting Employees to Fit the Job and the Organization. [TB: Ch. 7]
8. Training and Developing a Competitive Workforce. [TB: Ch. 8]
9. Conducting Performance Management. [TB: Ch. 9]
10. Developing an Approach to Total Compensation. [TB: Ch. 10]
11. Using Performance-Based Pay to Achieve Strategic Objectives. [TB: Ch. 11]
12. Providing Benefits and Services for Employees' Well-Being. [TB: Ch. 12]
13. Risk Management, Employee Relations, and Risk Management, Health, Safety, and Employee Well-Being. [TB: Ch. 13]
14. Understanding Unionization and Collective Bargaining. [TB: Ch. 14]

Textbook(s):
- Managing Human Resources by Susan E. Jackson, Randall S. Schuler and Steve Werner, South-Western College Pub; 11th Edition (June 16, 2011).ISBN-10: 1111580227

Reference Material:
- Management of Human Resources by Gary Dessler, CarolinRekar Munro and Nina D. Cole, Pearson Education Canada; 3rd Edition (February 28, 2010). ISBN-10: 0321687140

- Human Resource Management by Robert L. Mathis and John H. Jackson, South-Western Cengage Learning; 13th Edition (August 19, 2010). ISBN-10: 053845315X
- Human Resource Management Applications: Cases, Exercises, Incidents, and Skill Builders by Stella M. Nkomo, Myron D. Fottlerand R. Bruce McAfee, South-Western Cengage Learning; 7th Edition (September 29, 2010). ISBN-10: 0538468076

Course Title: Organizational Behaviour
Course Code: MNG-2217
Course Structure: Lectures: 3 / Labs: 0
Credit Hours: 3
Prerequisites: None

Course Objectives:
This course introduces the student to multidisciplinary approaches to human behaviour in organizational settings. Attention will be paid to both public and private sector organizations.

Course Syllabus:
Introduction, People-Centered Organizations and Ethical Conduct, Organizational Culture, Socialization, and Mentoring, Key Individual Differences, Values, Attitudes, Job Satisfaction, and Counterproductive Work Behaviors.Social Perceptions and Attributions.Foundations of Motivation.Improving Job Performance with Goals, Feedback, Rewards, and Positive Reinforcement.Group Dynamics. Developing and Leading Effective Teams. Individual and Group Decision Making.Managing Conflict and Negotiating.Communicating in the Digital Age.Leadership, Influence, Empowerment, and Politics.Organizational Design, Effectiveness, and Innovation.

Course Outline:
1. Organizational Behavior: The Quest for People-Centered Organizations and Ethical Conduct [TB: Ch.1]
2. Organizational Culture, Socialization, and Mentoring [TB: Ch. 3]
3. Key Individual Differences and the Road to Success [TB: Ch. 5]
4. Values, Attitudes, Job Satisfaction, and Counterproductive Work Behaviors [TB: Ch. 6]
5. Social Perceptions and Attributions [TB: Ch.7]
6. Foundations of Motivation [TB: Ch.8]
7. Improving Job Performance with Goals, Feedback, Rewards, and Positive Reinforcement [TB: Ch.9]
8. Group Dynamics [TB: Ch.10]
9. Developing and Leading Effective Teams [TB: Ch.11]
10. Individual and Group Decision Making [TB: Ch.12]
11. Managing Conflict and Negotiating [TB: Ch.13]
12. Communicating in the Digital Age [TB: Ch.14]
13. Leadership, Influence, Empowerment, and Politics [[TB: Ch.15, 16]
14. Organizational Design, Effectiveness, and Innovation [TB: Ch.17]

Textbook(s):

- Organizational Behavior by Robert Kreitnerand AngeloKinicki, McGraw-Hill/Irwin; 10 Edition (January 17, 2012). ISBN-10: 0078029368

Reference Material:

- Organizational Behavior by Stephen P. Robbins and Timothy A. Judge, Prentice Hall; 15th Edition (January 16, 2012). ISBN-10: 0132834871
- Meeting the Ethical Challenges of Leadership: Casting Light or Shadow by Craig E. Johnson, SAGE Publications, Inc; 4thEdition (February 28, 2011). ISBN-10: 1412982227

Course Title: Principles of Psychology
Course Code: SS-2410
Course Structure: Lectures: 3/Labs: 0
Credit Hours: 3
Prerequisites: None
Course Objectives:
The course provides an overview of the history and major issues of psychology, including learning and perception, personality theories, abnormal behavior, motivation and emotion, human development, social psychology.

Course Syllabus:
Attached as Annexure C

Course Title: Principles of Philosophy
Course Code: SS-2511
Course Structure: Lectures: 3/Labs: 0
Credit Hours: 3
Prerequisites: None

Course Objectives:
The overall goal of this course is to provide students with the basic understanding required to conduct and critique epidemiological studies.

Course Syllabus:
The Nature of Philosophy. Philosophical Theories: History and Back Ground, Realism and Idealism, Monism and Dualism, Rationalism, Empiricism, Criticism, and Empiricism. The Start of Modern Philosophy.Perception and Reality.Knowledge, Belief and Logic.Space, Time. Causality and Substance.Mind & Body.Knowledge.Language.Science.Morality.Politics.Law.Metaphysics.

Course Outline:

1. The Nature of Philosophy. [TB1: 1]
2. Philosophical Theories: History and Back Ground, Realism and Idealism, Monism and Dualism, Rationalism, Empiricism, Criticism, and Empiricism [TB3: Ch. 12, 13, 14,15]
3. The Start of Modern Philosophy [TB1: 2]
4. Perception and Reality [TB1: 3]
5. Knowledge, Belief and Logic [TB1: 4]

6. Space, Time, Causality and Substance [TB1: 5]
7. Mind & Body [TB2: 1]
8. Knowledge [TB2: 2]
9. Language [TB2: 3]
10. Science [TB2: 4]
11. Morality [TB2: 5]
12. Politics [TB2: 6]
13. Law [TB2: 7]
14. Metaphysics [TB2: 8]

Textbook(s):

1. An Introduction to Philosophy by Jon Nuttall, Polity; 1st Edition (July 29, 2002). ISBN-10: 0745616631
2. Thinking It Through: An Introduction to Contemporary Philosophy by Kwame Anthony Appiah, Oxford University Press, USA (November 6, 2003). ISBN-10: 0195134583
3. An Introduction To Philosophy by George Stuart Fullerton, CreateSpace Independent Publishing Platform (July 18, 2011). ISBN-10: 1463688881

Reference Material:

- Philosophy: An Introduction to the Art of Wondering by James L. Christian, Wadsworth Publishing; 11th Edition (January 26, 2011). ISBN-10: 1111298084
- Pleasures of Philosophy by Durant, Touchstone; Revised Edition (December 31, 1999). ISBN-13: 978-0671581107
- Philosophy Basics: A Jargon-Free Guide for Beginners by Doug Erlandson, Doug Erlandson (September 15, 2011). ASIN: B005NJRTUW
- Introduction to Philosophy by William James Earle, McGraw-Hill; 1st Edition (October 1, 1991). ISBN-10: 0070187835

Course Title: Financial Accounting
Course Code: MNG-2210
Course Structure: Lectures: 3/ Labs: 0
Credit Hours: 3
Prerequisites: None

2nd Term

Course Objectives:

This course intends to introduce students with knowledge of Financial Accounting required to help them to understand the process of financial management required to develop modern accounting information systems.

Course Syllabus:

Introduction to Accounting, Accounting Principles, Book Keeping, Basics of Financial Statements, Adjustments to Financial Statements, The Cash Book, Bank Reconciliation, Control Accounts, Property, Plant and Equipment (PPE), Accounting Errors, Accounting for Partnerships, Balance Sheet, Financial Asset, Accounting for inventories. Funds flow statement and simple cash flow activities.

Course Outline:

1. Introduction to Accounting: Nature, Purpose and Scope of Accounting, Objectives of Accounting, Users of Accounting Information and Their Respective Needs, Qualities of Useful Accounting Information, Accounting Principles: Going Concern, Accruals, Consistency, Prudence, Business Entity, Duality, Monetary Measurement, Substance Over Form, Realization.
2. Book Keeping: The Accounting Cycle, Double Entry Book-Keeping and Books of Original Entry, The Ledgers, Cash Book and the Trial Balance.
3. Basic Financial Statements: Structure of Financial Statements for a Sole Trader, Statement of Financial Position (The Balance Sheet) for A Sole Trader.
4. Adjustments to Financial Statements: Carriage In and Carriage Out, Bad Debts, Bad and Doubtful Receivables, Bad Debts Recovered, Drawings, Discount Received and Allowed, Accrued and Prepaid Income and Expenses and Depreciation and Disposal of Property, Plant and Equipment.
5. The Cash Book: Two-Column Cashbook, Three Column Cashbook, Analytical Cashbook and The Petty Cashbook.
6. Expected Learning Outcomes: Purpose of Bank Reconciliation, Causes of Differences Between Cash and Bank Balances, Bank Reconciliation Process, Bank Overdrafts, and DishonouredCheques.
7. Control Accounts: Uses of Control Accounts, Sales and Purchases Ledger Control Accounts.
8. Property, Plant and Equipment (PPE): Classification of Long-Term Assets, Accounting For PPE, Revenue and Capital Expenditure, Relevant Cost of PPE, Methods of Estimating Depreciation, Revaluation Method, Revaluation of PPE, Exchange of Assets, Disposal of Assets, Schedule of PPE and Presentation and Disclosure of PPE in the Financial Statements.
9. Accounting Errors: Types of Accounting Errors, Errors Not Affecting the Trial Balance and Errors Affecting the Trial Balance.Adjusted Trial Balance, Closing entries and post-closing Trial Balance.
10. Accounting for Partnerships: Introduction to Partnerships, Partnership Agreements, Appropriation of Profit, Personalaccounts, Partners Loan Accounts.

Textbook(s):

- Financial & Managerial Accounting by Jan Williams, Sue Haka, Mark Bettner and Joseph Carcello, McGraw-Hill/Irwin; 16th Edition (2011). ISBN-10: 0078111048

Reference Material:

- Fundamental Accounting Principles with Connect Plus by John Wild, Ken Shaw, and Barbara Chiappetta, McGraw-Hill/Irwin; 20th Edition (December 27, 2010). ISBN-10: 0077505980

- Principles of Managerial Finance by Lawrence J. Gitman and Chad J. Zutter, Prentice Hall; 13th Edition (2011). ISBN-10: 0136119468
- Accounting Principles by Jack L. Smith, Robert M. Keith and William L. Stephens, McGraw-Hill Companies, 3rd Edition (1993). ISBN-10: 0070430748
- Accounting: A Business Perspective (Irwin/Mcgraw-Hill Series in Principles of Accounting) by Roger H. Hermanson, James Don Edwards and Michael W. Maher (1998).ISBN-10: 0075615851

Course Name: Entrepreneurship
Course Code: MNG-3262
Course Structure: Lectures: 3/ Labs: 0
Credit Hours: 3
Pre-requisite: None

2nd Term

Course Objectives:
This course provides an understanding of the entrepreneurship process. It exposes them to the concepts, practices and tools of the entrepreneurial world. This will be accomplished through a combination of readings, cases studies and projects designed to convey the unique environment of the entrepreneurs and new ventures. The course gives students the tools necessary to think creatively, to plan out whether their idea is marketable to investors, guide them through the launch their own business, or to support an employer in launching and growing an entrepreneurial venture.

Course Syllabus:
Entrepreneurship and the Entrepreneurial Mind-Set.Entrepreneurial Intentions and Corporate Entrepreneurship. Entrepreneurial Strategy: Generating and Exploiting New Entries. Creativity and the Business Idea.Identifying and Analyzing Domestic and International Opportunities.Intellectual Property and Other Legal Issues for the Entrepreneur. The Business Plan: Creating and Starting the Venture. The Marketing Plan.The Organizational Plan.The Financial Plan.Sources of Capital.Informal Risk Capital, Venture Capital, and Going Public.Strategies for Growth and Managing the Implication of Growth.Succession Planning and Strategies for Harvesting and Ending the Venture.

Course Outline:
1. Entrepreneurship and the Entrepreneurial Mind-Set. [TB: Ch. 1]
2. Entrepreneurial Intentions and Corporate Entrepreneurship. [TB: Ch. 2]
3. Entrepreneurial Strategy: Generating and Exploiting New Entries. [TB: Ch. 3]
4. Creativity and the Business Idea. [TB: Ch. 4]
5. Identifying and Analyzing Domestic and International Opportunities. [TB: Ch. 5]
6. Intellectual Property and Other Legal Issues for the Entrepreneur. [TB: Ch. 6]
7. The Business Plan: Creating and Starting the Venture. [TB: Ch. 7]
8. The Marketing Plan. [TB: Ch. 8]
9. The Organizational Plan. [TB: Ch. 9]
10. The Financial Plan. [TB: Ch. 10]
11. Sources of Capital. [TB: Ch. 11]

12. Informal Risk Capital, Venture Capital, and Going Public. [TB: Ch. 12]
13. Strategies for Growth and Managing the Implication of Growth. [TB: Ch. 13]
14. Succession Planning and Strategies for Harvesting and Ending the Venture. [TB: Ch. 15]

Textbook(s):

1. Entrepreneurship by Robert Hisrich, Michael Peters and Dean Shepherd, McGraw-Hill/Irwin; 9th Edition (September 27, 2012). ISBN-10: 0078029198

Reference Material:

- Entrepreneurship: Ideas in Action by Cynthia L. Greene, South-Western Educational Pub; 5th Edition (January 6, 2011). ISBN-10: 0538496894
- Entrepreneurship by William D. Bygrave and Andrew Zacharakis, Wiley; 2nd Edition (October 12, 2010). ISBN-10: 0470450371
- Entrepreneurship: Theory, Process, and Practice by Donald F. Kuratko, South-Western College Pub; 8th Edition (November 14, 2008). ISBN-10: 0324590911
- Entrepreneurship: Successfully Launching New Ventures by Bruce R. Barringer and Duane Ireland, Prentice Hall; 4th Edition (October 27, 2011)

Course Title: Foreign/Regional Language (French, German, Sindhi, Punjabi etc.)
Course Code: SS-2XXX
Course Structure: Lectures: 3 / Labs: 0
Credit Hours: 3
Prerequisites: None
Course Objectives:
The course will develop students' functional skills of the offered language

Course Syllabus
Follow UOS's Relevant Department's Syllabus

Contents of Specialization Elective Courses

Course Title: Model-Driven Software Development
Course Code: SE-4349
Course Structure: Lectures:3/Labs:0
Credit Hours: 3
Prerequisites: SE-4345 (Design Patterns)
Course Objectives:
The learning objectives in this course are to become familiar with: (i) the notion of software architectures, different types of architectures, the role they play in software systems and in software development, architecture creation and evolution, architecture analysis, and documenting an architecture; and (ii) different types of design models, and how to develop models and check them for specific properties using modeling tools.

Course Syllabus:

MDSD – Basic Ideas & Terminology of Model-Driven Software Development (MDSE).A Typical Web Application Architecture Development.Common MDSD Concepts and Terminology.MDSD Classification.Meta-modeling.MDSD-Capable Target Architectures. Building Blocks for Software Architecture, Architecture Reference Model, Balancing the MDSD Platform, Architecture Conformance, MDSD &CBD; SOA,BPM & MDSD. Building Domain Architecture.Code Generation Techniques.Model Transformations with QVT.MDSD Tools. The MDA Standard: UML 2.0, MOF-Meta Object Facility, XMI, PIM/PSM/PDM, Multi-stage Transformations, Action Languages, Core Models, Controlling the PIM to PSM Transformation, Executable UML. MDSD Process Building Block & Best Practices.Testing.Versioning.

Course Outline:

1. MDSD – Basic Ideas & Terminology, An overview of MDA Concepts, Architecture-Centric MDSD. [TB: Ch. 2]
2. A Typical Web Application: Application Development, Architecture Development. [TB: Ch. 3]
3. Common MDSD Concepts and Terminology, Model-Driven Architecture, Architecture-Centric Architecture, Generative Programming. Software Factories, Model-Integrated Computing, Language-Oriented Programming, Domain-Specific Modeling. [TB: Ch. 4]
4. Classification: MDSD vs. CASE, 4GL & Wizards, MDSD vs. Roundtrip Engineering, MDSD & Patterns, MDSD & Domain-Driven Design, MDSD, Data Driven Development & Interpreters, MDSD & Agile Software Development. [TB: Ch. 5]
5. Meta-modeling: What is Meta-modeling? Meta-levels vs. Level of Abstraction, MOF & UML, Extending UML, UML Profiles, Meta-modeling & OCL, Pitfalls in Meta-modeling. [TB: Ch. 6]
6. MDSD-Capable Target Architectures: Software Architecture in the Context of MDSD, What is a Sound Architecture? How do you Arrive at a Sound Architecture, Building Blocks for Software Architecture, Architecture Reference Model, Balancing the MDSD Platform, Architecture Conformance, MDSD &CBD; SOA,BPM & MDSD. [TB: Ch. 7]
7. Building Domain Architecture: DSL construction, General Transformation Architecture, Technical Aspects of Building Transformation The Use of Interpreters. [TB: Ch. 8]
8. Code Generation Techniques: Code Generation – Why? Categorization, Generation Techniques. [TB: Ch. 9]
9. Model Transformations with QVT: History, M2M Language Requirements, Overall Architecture, An Example Transformation, The OMG Standardization Process & Tool Availability, Assessment. [TB: Ch. 10]
10. MDSD Tools: Roles, Architecture, Selection Criteria & Pointers: The Role of Tools in the Development Process, Tool Architecture & Selection Criteria, Pointers. [TB: Ch. 11]
11. The MDA Standard: Goals, Core Concepts , –UML 2.0, MOF-Meta Object Facility, XMI, PIM/PSM/PDM, Multi-stage Transformations, Action Languages, Core Models, Controlling the PIM to PSM Transformation, Executable UML. [TB: Ch. 12]
12. MDSD Process Building Block & Best Practices: Introduction, Separation between Application & Domain Architecture Development, Two-Track Iterative Development, Target Architecture Development Process, Product-Line. [TB: Ch. 13]
13. Testing: Test Types, Test in Model-Driven Application Development, Testing the

Domain Architecture. [TB: Ch. 14]

14. Versioning: What is versioned? Projects & Dependencies, The Structure of Application Projects, Version Management & Build Process for Mixed Files, Modeling in a Team & Versioning of Partial Models. [TB: Ch. 15]

Textbook(s):

- Model-Driven Software Development: Technology, Engineering, Management by Thomas Stahl, Markus Voelter and Krzysztof Czarnecki; Publisher: Wiley; 1st Edition (May 19, 2006). ISBN-10: 0470025700

Reference Material:

- Model-Driven Software Engineering in Practice by Marco Brambilla, Jordi Cabot and Manuel Wimmer, Morgan & Claypool Publishers; 1st Edition (September 26, 2012). ISBN-10: 1608458822
- The Pragmatic Programmer: From Journeyman to Master by Andrew Hunt and David Thomas, Addison-Wesley Professional; 1st Edition (October 30, 1999). ISBN-10: 020161622X
- Model-Driven Software Development: Integrating Quality Assurance by JorgRech and Christian Bunse, Information Science Reference; 1st Edition (August 22, 2008). ISBN-10: 160566006X
- Model-Driven Software Development with UML and Java by K. Lano, Course Technology (August 15, 2009). ISBN-10: 1844809528

Course Title: Design Patterns

8th Term

Course Code: SE-4345
Course Structure: Lectures: 3/0
Credit Hours: 3
Prerequisites: CMP-3310(Software Engineering)

Course Objectives:
The aim of this course is to make the students competent in designing effective and maintainable complex software systems of high quality. To this end, students will learn and gain hands-on experience in designing software systems by reusing/applying design patterns. Design patterns are successful solutions to recurring problems that arise when building software systems. Reusing design patterns helps to prevent subtle issues that can cause major problems and improves code readability for the developers familiar with the patterns. In addition to mastering these good design abstractions, the students will also learn how to evaluate a design, identify common problems, and how to fix these problems through refactoring.

Course Syllabus:
Overview of Object-oriented design, Overview of UML & OCL.Introduction to design patterns.Coupling and Cohesion. Why design patterns? Creational patterns: Singleton, Abstract Factory, Builder, Prototype. Structural patterns: Facade, Composite, Bridge, Proxy, Adapter, Decorator. Behavioral patterns: Chain of responsibility, Visitor, Observer, Iterator, Command, Mediator, Strategy, Interpreter, Memento. Patterns for concurrent and distributed systems: Event handling patterns. Synchronization and Concurrency patterns.Concurrency Controller

pattern.Antipatterns: Common pitfalls and antipattern examples, Recovering from bad designs, Refactoring to patterns. Introduction to Aspect-Oriented design: Aspects, themes, concerns

Course Outline:

1. Overview of Object-oriented design.
2. Overview of UML: Use cases, class diagrams, and other UML diagrams.
3. Object constraint language (OCL)
4. Review of "Getting started using the use cases to capture requirements" by J. Rumbaugh
5. Introduction to design patterns : Coupling and cohesion, Why design patterns?
6. Reading assignment: The paper "Design Patterns: Abstraction and Reusable of Object Oriented Design" by E. Gamma, R. Helm, R. Johnson, and J. Vlissides
7. Creational patterns: Singleton, Abstract Factory, Builder, Prototype
8. Structural patterns : Facade, Composite, Bridge, Proxy, Adapter, Decorator
9. Behavioral patterns :Chain of responsibility, Visitor, Observer, Iterator, Command, Mediator, Strategy, Interpreter, Memento
10. Patterns for concurrent and distributed systems: Event handling patterns (ref. 3). Synchronization and Concurrency patterns (ref. 3 &4) . Concurrency Controller pattern
11. Anti-patterns: Common pitfalls and antipattern examples. Recovering from bad designs. Refactoring to patterns

Textbooks:

1. Design Patterns: Elements of Reusable Object Oriented Software, E. Gamma, R. Helm, R. Johnson, and J. Vlissides, Addison -Wesley Professional, 1995
2. Java Design Pattern Essentials by Tony Bevis, Ability First Limited; 2nd Edition (October 11, 2012). ISBN-10: 0956575846

Reference Material:

1. Patterns in Java: A Catalog of Reusable Design Patterns Illustrated with UML by Mark Grand, 2nd Edition, Volume 1, Wiley, 2002 . ISBN-10: 0471227293
2. Object-Oriented Software Engineering: Using UML, Patterns, and Java by B. Bruegge and A. H. Dutoit, 2nd Edition , Prentice Hall, 2003. ISBN-10: 0136061257
3. Refactoring to Patterns by J. Kerievsky, Addison-Wesley, 2004. ISBN-10: 0321213351
4. A System of Patterns: Pattern-Oriented Software Architecture by Buschmann, F., Meunier, R., Rohnert, H., Sommerlad, P. &Stal, M, Wiley & Sons, 1996. ISBN-10: 0471958697
5. Pattern-Oriented Software Architecture: Patterns for Concurrent and Networked Objects by D.C Schmidt, M. Stal, H. Rohnert and F. Bushmann, Wiley & Sons, 2000
6. Aspect-Oriented Analysis and Design: The Theme Approach, S. Clarke and E. Baniassad, Addison-Wesley Professional, 2005 . ISBN-10: 0321246748
7. Aspect Oriented Software Development with Use Cases, I. Jacobson and Pan-Wei Ng, Addison-Wesley Professional, 2004. ISBN-10: 0321268881

Course Title: Software CASE Tools & Applications
Course Code: SE-4344
Course Structure: Lectures: 3/Labs: 0
Credit Hours: 3

6th Term

Prerequisites: CMP-3310 (Software Engineering)

Course Objectives:

The course provides a comprehensive study and use of computer-aided software development tools for data modeling, process modeling and UI modeling; evolution and reuse of software components in domain analysis; and the creation of large scale information systems.

Course Syllabus:

Introduction to CASE, Types of CASE Tools. Approaches CASE Tool Integration. Integration as a Design Activity. Service Based Model of a CASE Environment. Properties and Types of Integration Mechanism.The Role of Process in Integrated CASE Environments.Examples of Process and CASE Tool Interactions.Replacing the Message Service in a CASE Integration Framework.Integration of CASE Tools with CM Systems.Case Environments in Practice.Object-Oriented Analysis & Design Modeling. Design Reuse, E-Commerce, ISO. Comparison of Popular CASE Tools. Practice Real Life Problem for Development Through CASE Tools.

Course Outline:

1. Introduction to: CASE, Types of CASE Tools, Case Environment, Expectations about CASE and the Need for Tool Integration, Example of CASE tool Integration. [TB: Ch. No.1]
2. Approaches CASE Tool Integration, Conceptual Model of Integration, Evolution of Integrated CASE Environment Architectures [TB: Ch. No.2]
3. Integration as a Design Activity [TB: Ch. No.3]
4. Service Based Model of a CASE Environment: Overview of PSE Reference Model, Description of Reference Model Services, Uses of Reference Model [TB: Ch. No.4]
5. Properties and Types of Integration Mechanism: The Relationship between Data and Control Model, Presentation Integration[TB: Ch. No.5]
6. The Role of Process in Integrated CASE Environments: Nature of Process Integration, Process Integration and CASE Tools and Environments [TB: Ch. No.8]
7. Examples of Process and CASE Tool Interactions [Ch. No.8]
8. Replacing the Message Service in a CASE Integration Framework: Background, Adding the ToolTalk Interface, Running the Experiment Scenario, Replacing the ToolTalk in the Emulation Framework [TB: Ch. No.10]
9. Integration of CASE Tools with CM Systems: Key Concepts Related to CM and CASE Tools Integration, CASE Tool Integration Scenarios Involving CM[TB: Ch. No.11]
10. Case Environments in Practice: Background and Studies, Observations, An Example of Transitional CASE Environment, CASE Environment Progress Over the Past Decade[TB: Ch. No.12]
11. Object-Oriented Analysis & Design Modeling: Business Process Models, Design Reuse, E-Commerce, ISO [Handouts]
12. Comparison of Popular CASE Tools (Online Material)
13. Practice Real Life Problem for Development Through CASE Tools

Textbook(s):

- Principles of CASE Tool Integration by Alan W. Brown, Oxford University Press, USA; 1st Edition, (September 1, 1994)ISBN-10: 0195094786
- A http://www.umsl.edu/~sauterv/analysis/6840_f09_papers/I%20Gusti/index.html

Reference Material:

- Computer Aided Software Engineering by Hausi A. Muller, Ronald J. Norman and Jacob Slonim, Springer; Softcover reprint of the original 1st Edition 1996 (September 27, 2011). ISBN-10: 1461286263.
- Most popular software CASE tool documentation

Course Title: E-Commerce Applications Development
Course Code: CS-4746
Course Structure: Lectures: 3/Labs: 0
Credit Hours: 3
Prerequisites: CMP-3310 (Software Engineering)
Course Objectives:
This course focuses on electronic commerce applications, technologies, and tools which are used to conduct business on the World Wide Web.

Course Syllabus:
An overview of e-Commerce & Models, Planning an e-Commerce Framework, Managing Products and Categories, Product Variations and User Uploads, Enhancing the User Experience, The Shopping Basket, The Checkout and Order Process, Shipping and Tax, Discounts, Vouchers, and Referrals, Checkout, Taking Payment for Orders, User Account Management. Administration: Dashboard, Managing Products and Categories, Managing Orders, Customers, Refunds, Voucher Codes, Shipping, Deploying, Security, and Maintenance, SEO.

Course Outline:
1. e-Commerce: An overview of e-Commerce, Brick 'N Mortar stores vs Service-based companies , e-Commerce Models, e-Commerce popular sites: iStockphoto, WooThemes, eBay, Amazon, Play.com. [TB: Ch.1]
2. Planning an e-Commerce Framework: Designing a framework, Patterns, Model-View-Controller, Registry , Singleton, Structure, Building a framework, Routing requests. [TB: Ch.2]
3. Products and Categories: Product information, Category information, Structuring Content, Versioning, Building products, categories, and content functionality, Routing products and categories. [TB: Ch.3]
4. Product Variations and User Uploads: Giving users choice, Giving users control. Shopping. [TB: Ch.4]
5. Enhancing the User Experience: The importance of user experience, Search, Providing wish lists, Making Recommendations, Stock Checking, Customer's Feed Back, Processing reviews/comments. [TB: Ch.5]
6. The Shopping Basket: Creating A Basket, Basket Contents, Managing the Basket, Cleaning the Basket. [TB: Ch.6]
7. The Checkout and Order Process: The Process, Authentication, Payment Method, Order Processed. [TB: Ch.7]
8. Shipping and Tax: Shipping Methods, Shipping Costs, Shipping Rules, Tracking, Tax Calculation. [TB: Ch.8]
9. Discounts, Vouchers, and Referrals: Discount codes, Purchasable Voucher Codes, Referrals. [TB: Ch.9]
10. Checkout: Checkout process consideration, Order process review, Authentication & Confirmation. [TB: Ch.10]

11. Taking Payment for Orders: Taking payment, Payment System, Payment gateway, Taking Payment Online, Taking payment offline. [TB: Ch.11]
12. User Account Features: User Account Area, Changing Details, Viewing & Managing Orders. [TB: Ch.12]
13. Administration: Dashboard, Managing Products and Categories, Managing Orders, Customers, Refunds, Voucher Codes, Shipping , etc. [TB: Ch.3]
14. Deploying, Security, and Maintenance, SEO. [TB: Ch.14, 15]

Note: Class project must be implemented using Jquery and Ajax technologies

Textbook(s):

- PHP 5 E-commerce Development by Michael Peacock, Packt Publishing (January 20, 2010). ISBN-10: 184719964X
- Learning jQuery by Jonathan Chaffer and Karl Swedberg, Packt Publishing; 3rd Edition (September 23, 2011). ISBN-10: 1849516545
- Ajax: The Complete Reference by Thomas Powell, McGraw-Hill Osborne Media; 1st Edition (February 21, 2008). ISBN-10: 007149216X

Reference Material:

- Introduction to E-Commerce by Jeffrey F. Rayport, McGraw-Hill, 2nd Edition (2007). ISBN-10: 0071232664
- E-Commerce 2012 (8th Edition) by Kenneth Laudon and Carol Guercio Traver, Prentice Hall; 8th Edition (2011). ISBN-10: 0138018812
- The Legal Environment of Business: Text and Cases - Ethical, Regulatory, Global, and Corporate Issues by Frank B. Cross and Roger LeRoy Miller, South-Western College/West; 8th Edition (2011). ISBN-10: 0538453990
- e-Business and e-Commerce How to Program by Harvey M. Deitel, Paul J. Deitel and Tem R. Nieto, Prentice Hall; 1st Edition (2000). ISBN-10: 013028419X
- The Complete E-Commerce Book:Design, Build & Maintain a Successful Web-based Business by Janice Reynolds, Cmp Books (2000). ISBN-10: 157820061X
- Effortless E-Commerce with PHP and MySQL by Larry E. Ullman, New Riders; 1st Edition (2010). ISBN-10: 0321656229

Course Title: Enterprise Resource Planning Systems

7th Term

Course Code: CS-4461
Course Structure: Lectures: 3/Labs: 0
Credit Hours: 3
Prerequisites: CMP-3450 (Database Systems)
Course Objectives:
This course covers ERP theory and practice. Course content includes evolution of ERP systems, business process reengineering, process mapping, ERP life cycle, ERP functionality, ERP bolt-ons and security and risk issues.
Course Syllabus:
Introduction to Enterprise Resource Planning Systems.ERP Technology.ERP and Business Process Reengineering.Systems Diagramming and the Process Map. ERP Life Cycle: Planning and Package Selection. ERP Life Cycle: Implementation and Operation and Maintenance. ERP Sales, CRM and Knowledge Management.ERP Financials.Human Capital Management, Self-

Service and Outsourcing.Manufacturing Systems and Supply Chain.Auditing ERP.Business Intelligence and Performance Management.

Course Outline:

1. Introduction to Enterprise Resource Planning Systems. [TB. Ch. 1]
2. ERP Technology. [TB. Ch. 2]
3. ERP and Business Process Reengineering. [TB. Ch. 3
4. Systems Diagramming and the Process Map. [TB. Ch. 41]
5. ERP Life Cycle: Planning and Package Selection. [TB. Ch. 5]
6. ERP Life Cycle: Implementation and Operation and Maintenance. [TB. Ch. 6]
7. ERP Sales, CRM and Knowledge Management. [TB. Ch. 7
8. ERP Financials. [TB. Ch. 8]
9. Human Capital Management, Self-Service and Outsourcing. [TB. Ch. 9]
10. Manufacturing Systems and Supply Chain. [TB. Ch. 10]
11. Auditing ERP . [TB. Ch. 11]
12. Business Intelligence and Performance Management. [TB. Ch. 12]

Textbook(s):

- Modern ERP: Select, Implement & Use Today's Advanced Business Systems by Marianne Bradford, lulu.com (October 19, 2009). ISBN-10: 0557012910.

Reference Materials:

- Managerial Issues of Enterprise Resource Planning Systems by David Olson, McGraw-Hill/Irwin; 1st Edition (September 10, 2003). ISBN-10: 0072861126
- Enterprise Resource Planning by Bret Wagner by Ellen Monk, Course Technology; 3rd Edition (February 4, 2008). ISBN-10: 1423901797
- ERP Systems byDimpiSrivastava by AartiBatra, I K International Publishing House (February 15, 2010). ISBN-10: 9380578148

Course Title: Mobile Application Development

7th Term

Course Code: CS-4547
Course Structure: Lectures: 3 / Labs: 0
Credit Hours: 3
Prerequisites: CMP-2123 (Object Oriented Programming)
Course Syllabus:

What is Android? Installing and Configuring the Android SDK Manager, Creating Android Application, Anatomy of an Android Application. Eclipse.Fragments, Calling Built-In Applications Using Intents, Displaying Notifications.Components of a Screen, Adapting to Display Orientation, Managing Changes to Screen Orientation, Utilizing the Action Bar, Creating the User Interface.Listening for UI Notifications.Views, User Preferences.Presisting Data. Sharing Data.Sending SMS Messages.Getting Feedback.Sending E-mail.Displaying Maps, Consuming Web Services Using HTTP, Accessing Web Services.Creating Services.Threading.Android games Development, Publishing Android Applications.Handling Telephone Calls, Fonts.

Course Outline:

1. What is Android? Obtaining the Required Tools, Installing and Configuring the Android SDK Manager, Creating Your First Android Application, Anatomy of an Android Application. [Tb1:Ch 1]
2. The Big Picture, How to Get Started, Your First Android Project, A bit About Eclipse, Enhancing Your First Project[Tb2:Ch 1-6]
3. Understanding Activities, Linking Activities Using Intents, Fragments, Calling Built-In Applications Using Intents, Displaying Notifications.[Tb1:Ch 2]
4. Understanding the Components of a Screen, Adapting to Display Orientation, Managing Changes to Screen Orientation, Utilizing the Action Bar, Creating the User Interface Programmatically, Listening for UI Notifications.[Tb1:Ch 3]
5. Using Basic Views, Using Picker Views, Using List View to Display Long Lists, Understanding Specialized Fragments.[Tb1:Ch 4]
6. Using Image Views to Display Pictures, Using Menus with Views, AnalogClock and DigitalClock Views.[Tb1:Ch 5]
7. Saving and Loading User Preferences, Presisting Data to Files, Creating and Using Databases.[Tb1:Ch 6]
8. Sharing Data in Android, Using a Content Provider, Creating Your Own Content Providers, Using the Content Provider.[Tb1:Ch 7]
9. Sending SMS Messages Programmatically, Getting Feedback after Sending a Message, Sending SMS Messages Using Intent, Receiving SMS Messages, Sending E-mail.[Tb1:Ch 8]
10. Displaying Maps, Getting Location Data, Monitoring a Location, Building a Location Tracker.[Tb1:Ch 9]
11. Consuming Web Services Using HTTP, Accessing Web Services Using the Get Method, Consuming JSON Services, Sockets Programming.[Tb1:Ch 10]
12. Creating Your Own Services, Establishing Communication between a Service and an Activity, Binding Activities to Services, Understanding Threading.[Tb1:Ch 11]
13. Android games Development, Publishing Android Applications[Tb3, Tb1: Ch12]
14. Handling Telephone Calls, Fonts.[Tb2:Ch 41, 42]

Textbook(s):

1. Beginning Android 4 Application Development by Wei-Menge Lee, John Wiley & Sons, 2012
2. Beginning Android 4 by Grant Allen, Apress, (2011), ISBN: *1430239840.*
3. Beginning Android games by Mario Zechner, Apress, (2011), ISBN: 1430230428

Reference Material:

- Pro Android 4 by SatyaKomatineni and Dave MacLean , (2012), ISBN:1430239301Apress
- Professional Android 4 Application Development by Reto Meier, Wiley ,(2012), ISBN:1118237226

Course Title: Enterprise Application Development
Course Code: CS-4744
Course Structure: Lectures: 3 / Labs: 0
Credit Hours: 3
Prerequisites:CS-3548 (Web Systems and Technologies)

Course Objectives:
The course is aimed at creating robust enterprise applications using J2EE technologies that allow for rapid change and growth.

Course Syllabus:
Object-Oriented Programming Review, Software Architectures Overview, Challenges and Platform of Enterprise Application Development, J2EE Scenarios, J2EE Platform Technologies, The Client Tier, The Web Tier, The Enterprise JavaBeans Tier, Integrating with the Enterprise Information System Tier, Packaging and Deployment, Transaction Management, Security, J2EE Internationalization and Localization, Architecture of the Sample Application.

Course Outline:
1. Object-Oriented Programming Review, Software Architectures Overview: Desktop, File/Server, 2-Tier Client/Server, Multi-Tier Client/Server. [TB: Ch. 1]
2. Challenges of Enterprise Application Development, the Platform for Enterprise Solutions, J2EE Scenarios. [TB: Ch. 2]
3. J2EE Platform Technologies: Component Technologies, Platform Roles, Platform Services, Service Technologies, Communication Technologies. [TB: Ch. 3]
4. The Client Tier: Client Considerations, General Design Issues and Guidelines, Design Issues and Guidelines for Browser Clients, Design Issues and Guidelines for Java Clients. [TB: Ch. 4]
5. The Web Tier: The Purpose of the Web Tier, Web-Tier Technologies, Web-Tier Application Structure, Web-Tier Application Framework Design. [TB: Ch. 5]
6. The Enterprise JavaBeans Tier: Business Logic and Business Objects, Enterprise Beans as J2EE Business Objects, Remote and Local Client Views, Entity Beans, Session Beans, Message-Driven Beans, Design Guidelines, Portability Guidelines. [TB: Ch. 6]
7. Integrating with the Enterprise Information System Tier: Integration Scenarios, J2EE Integration Technologies, Application Integration Design Approaches, Developing an Integration Layer. [TB: Ch. 7]
8. Packaging and Deployment: Packaging Components, Roles and Tasks, Packaging J2EE Applications, Deployment Descriptors, Deployment Tools. [TB: Ch. 8]
9. Transaction Management: Transactional Concepts, J2EE Platform Transactions, J2EE Transaction Technologies, Client Tier Transactions, Web Tier Transaction Guidelines, Enterprise JavaBeans Tier Transactions, EIS Tier Transactions, J2EE Resource Manager Types. [TB: Ch. 9]
10. Security: Security Threats and Mechanisms, Authentication, Authorization, Protecting Messages, Auditing. [TB: Ch. 10]
11. J2EE Internationalization and Localization: Internationalization Concepts and Terminology, Using J2SE Internationalization APIs in J2EE Applications, Web Tier Internationalization, EIS Tier Internationalization, Internationalized Application Design, Internationalizing Applications with XML, Logging Messages. [TB: Ch. 11]
12. Architecture of the Sample Application: J2EE Architecture Approaches, Sample Application Overview, Designing the Sample Application, Architecture of the Sample Application. [TB: Ch. 12]

Textbook(s):
- Designing Enterprise Applications with the J2EE™ Platform by Inderjeet Singh; Beth

Stearns; Mark Johnson; 2nd Edition, Prentice Hall (March 25, 2002). Print ISBN-10: 0-201-78790-3

Reference Material:

- Mastering Enterprise JavaBeans 3.0 bySriganesh, R.P., Brose, G., And Silverman, M. Wiley Publishing, Indianapolis, (2006). ISBN 0-471-78541-5.
- Core J2EE Patterns: Best Practices and Design Strategies by Deepak Alur, Dan Malksand JohnCrupi, Prentice Hall; 2nd Edition (May 10, 2003). ISBN-10: 0131422464
- Sun Certified Enterprise Architect for Java EE Study Guide by Mark Cade and Humphrey Sheil, Prentice Hall; 2nd Edition (February 8, 2010). ISBN-10: 0131482033

Course Title: Artificial Intelligence
Course Code: CS-3811
Course Structure: Lectures: 3/Labs: 0
Credit Hours: 3
Prerequisites: CMP-2111(Discrete Structures)
Course Objectives:

This course will introduce the basic principles in artificial intelligence. It will cover simple representation schemes, problem solving paradigms, constraint propagation, and search strategies. Areas of application such as knowledge representation, natural language processing, expert systems, vision and robotics will be explored. The Prolog programming language will also be introduced.

Course Syllabus:

What is AI, Foundations of AI, History of AI. Weak AI, Strong AI. Intelligent Agents: Agents and Environments, The Nature of Environments, The Structure of Agents. Problem Solving by Searching. Breadth-First Search, Depth-First Search, Depth-limited Search, Iterative Deepening, Depth-first Search, Comparison of Uninformed Search Strategies. Informed Search and Exploration. Constraint Satisfaction Problems. Reasoning and Knowledge Representation. Inference in First-Order Logic. Introduction to Prolog Programming. Reasoning Systems for Categories. Reasoning with Uncertainty & Probabilistic Reasoning. Representing Knowledge in an Uncertain Domain. Learning from Observations. Knowledge in Learning. Statistical Learning, Neural Networks.

Course Outline:

16. Introduction: What is AI, Foundations of AI, History of AI. Intelligent Agents: Agents and Environments, The Nature of Environments, The Structure of Agents [TB: Ch. 1, 2]
17. Problem Solving by Searching: Problem Solving Agents, Searching for Solutions, Uninformed Search Strategies.
18. Breadth-First Search, Depth-First Search, Depth-limited Search, Iterative Deepening, Depth-first Search, Comparison of Uninformed Search Strategies. [TB: Ch. 3]
19. Informed Search and Exploration: Informed (Heuristic) Search Strategies: Greedy Best-first Search, A* Search, Heuristic Functions, Local Search Algorithms and Optimization Problems. [TB: Ch. 4]
20. Constraint Satisfaction Problems: Backtracking Search for CSPs, Local Search for CSPs. Adversarial Search: Games, Minimax Algorithm, Alpha-Beta Pruning. [TB: Ch.

5, 6]

21. Reasoning and Knowledge Representation: Introductions to Reasoning and Knowledge Representation, Propositional Logic, First Order Logic: Syntax and Semantics of First-Order Logic, Knowledge Engineering in First-Order Logic, [TB: Ch. 7, 8]
22. Inference in First-Order Logic: Inference rules for quantifiers, A first-order inference rule, Unification, Forward Chaining, Backward Chaining, A backward chaining algorithm, Logic programming, The resolution inference rule [TB: Ch. 9]
23. Introduction to Prolog Programming
24. Reasoning Systems for Categories, Semantic Nets and Description logics, Reasoning with Default Information: Open and closed worlds, Negation as failure and stable model semantic. Truth Maintenance Systems [TB: Ch. 10]
25. Reasoning with Uncertainty & Probabilistic Reasoning : Acting Under Uncertainty, Bayes' Rule and Its Use, [TB: Ch 13]
26. Representing Knowledge in an Uncertain Domain, The Semantics of Bayesian Networks. [TB: Ch. 14]
27. Learning from Observations: Forms of Learning , Inductive Learning,, Learning Decision Trees [TB: Ch. 18]
28. Knowledge in Learning, Explanation-Based Learning, Inductive Logic Programming. [TB: 19]
29. Statistical Learning, Neural Networks [TB: Ch. 20]

Textbook(s):

- Artificial Intelligence: A Modern Approach, by Russell and Norvig, Prentice Hall. 2nd Edition. ISBN-10: 0137903952

Reference Material:

- Artificial Intelligence: A Systems Approach by M. Tim Jones, Jones and Bartlett Publishers, Inc; 1st Edition (December 26, 2008). ISBN-10: 0763773379
- Artificial Intelligence in the 21st Century by Stephen Lucci , Danny Kopec, Mercury Learning and Information (May 18, 2012). ISBN-10: 1936420236

Course Title: Cloud Computing

8th Term

Course Code: CS-4544
Course Structure: Lectures: 3/Labs: 0
Credit Hours: 3
Prerequisites: CMP-3621 (Operating Systems)
Course Objectives:

This course gives an introduction to cloud computing and related techniques, issues, ecosystem and case studies. Students will become familiar with cloud services and their techniques through labs and the Semester project.

Course Syllabus:

Overview of Distributed Computing, Emergence of Cloud Computing, Global Nature of the Cloud, Cloud-Based Service Offerings, Grid Computing , Reliability of Cloud Model, Benefits of Cloud Model, Legal Issues, Key Characteristics of Cloud Computing, Challenges for the Cloud. The Evolution of Cloud Computing. Web Services Delivered from the Cloud: Communication-as-a-Service (CaaS), Infrastructure-as-a-Service, Monitoring-as-a-Service

(MaaS), Platform-as-a-Service (PaaS), Software-as-a-Service (SaaS), Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS). Building Cloud Networks.Virtualization.Federation, Presence, Identity, and Privacy in the Cloud.Security in the Cloud. Common Standards in Cloud Computing. End-User Access to Cloud Computing. Mobile Internet Devices and the Cloud.

Course Outline:

1. Overview of Distributed Computing, Emergence of Cloud Computing, Global Nature of the Cloud, Cloud-Based Service Offerings, Grid Computing , Reliability of Cloud Model, Benefits of Cloud Model, Legal Issues, Key Characteristics of Cloud Computing, Challenges for the Cloud. [TB1]
2. The Evolution of Cloud Computing: Computer Hardware Evolution, Internet Software Evolution, Server Virtualization. [TB1: Ch. 1]
3. Web Services Delivered from the Cloud: Communication-as-a-Service (CaaS), Infrastructure-as-a-Service, Monitoring-as-a-Service (MaaS), Platform-as-a-Service (PaaS), Software-as-a-Service (SaaS), Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS). [TB1: Ch. 2]
4. Building Cloud Networks: Evolution from the MSP Model to Cloud, The Cloud Data Center, Collaboration, Service-Oriented Architectures, Basic Approach to a Data Center-Based SOA, The Role of Open Source Software in Data Centers. [TB1: Ch. 3]
5. Virtualization: Sun xVMVirtualBox, FreeDOS, 7-Zip Archive Tool. [TB1: Ch. 4]
6. Federation, Presence, Identity, and Privacy in the Cloud: Federation in the Cloud, Presence in the Cloud, Privacy and Its Relation to Cloud-Based Information Systems. [TB1: Ch. 5]
7. Security in the Cloud, Cloud Security Challenges, Software-as-a-Service Security, Is Security-as-a-Service the New NSSP? [TB1: Ch. 6]
8. Common Standards in Cloud Computing: The Open Cloud Consortium, The Distributed Management Task Force, Standards of Application Development, Standards for Messaging, Standards for Security. [TB1: Ch. 7]
9. End-User Access to Cloud Computing: YouTube, YouTube API Overview, Zimbra, Facebook, Zoho, DimDim Collaboration. [TB1: Ch. 8]
10. Mobile Internet Devices and the Cloud: Smartphones, Mobile Operating Systems for Smartphones, Mobile Platform Virtualization, Collaboration Applications for Mobile Platforms. [TB1: Ch. 9]

Textbook(s):

- Cloud Computing Implementation, Management, and Security by John W. Rittinghouse and James F. Ransome, Taylor and Francis Group, LLC (2010). ISBN 978-1-4398-0680-7.

Reference Material:

- Cloud Computing Explained: Implementation Handbook for Enterprises by John Rhoton, Recursive Press (2009). ISBN-10: 0956355609.
- Cloud Computing and SOA Convergence in Your Enterprise: A Step-by-Step Guide by David S. Linthicum, Addison-Wesley Professional; 1st Edition (2009). ISBN-10: 0136009220.
- Cloud Computing Bible by Barrie Sosinsky, Wiley; 1st Edition (2011). ISBN-10: 0470903562.

- Cloud Application Architectures: Building Applications and Infrastructure in the Cloud (Theory in Practice (O'Reilly)) by George Reese, O'Reilly Media; 1st Edition (2009). ISBN-10: 0596156367.
- Securing the Cloud: Cloud Computer Security Techniques and Tactics by Vic (J.R.) Winkler, Syngress; 1st Edition (2011). ISBN-10: 1597495921.
- Private Cloud Computing: Consolidation, Virtualization, and Service-Oriented. Infrastructure by Stephen R Smoot and Nam K Tan, Morgan Kaufmann; 1st Edition (2011). ISBN-10: 0123849195.

Course Title: Multimedia Systems and Design
Course Code: CS-3743
Course Structure: Lectures: 3/ Lab: 0
Credit Hours: 3
Prerequisites: None

5th Term

Course Objectives:
The course introduces students with the complete process of multimedia system specifications, formats, design, testing, and prototyping, including the tools and techniques for integrating multimedia content into a product.

Course Syllabus:
What is Multimedia? Text, Multimedia Authoring and Tools, Multimedia Authoring, Multimedia Production, Multimedia Presentation, Automatic Authoring; Editing and Authoring Tools- (Adobe Premiere, Macromedia Director, Macromedia Flash, Dreamweaver), VRML, Handling Images, Sound, Making Animation and Video, Making Multimedia, Multimedia Skills, Planning and Costing, Designing and Producing, Content and Talent, The Internet and Multimedia, Designing for the World Wide Web, Delivering Multimedia Product.

Course Outline:

1. What is Multimedia? Text [TB1. Ch. 1, 2]
2. Multimedia Authoring and Tools: Multimedia Authoring, Multimedia Production, Multimedia Presentation, Automatic Authoring; Editing and Authoring Tools- Adobe Premiere, Macromedia Director, Macromedia Flash, Dreamweaver; VRML. [TB2: Ch. 2]
3. Handling Images. [TB1. Ch. 3]
4. Handling Sound. [TB1. Ch. 4]
5. Handling Animation. [TB1. Ch. 5]
6. Handling Video. [TB1. Ch. 6]
7. Making Multimedia. [TB1. Ch. 7]
8. Multimedia Skills. [TB1. Ch. 8]
9. Planning and Costing. [TB. Ch. 9]
10. Designing and Producing [TB1. Ch. 10]
11. Content and Talent. [TB1. Ch. 11]
12. The Internet and Multimedia [TB1. Ch. 12]
13. Designing for the World Wide Web; [TB1. Ch. 13]
14. Delivering. [TB1. Ch. 14]

[Instructors need to devise a content delivery and Lab work plan using a multimedia Authoring

tool in line with the contents of the textbook]

Textbook(s):

- Multimedia Making It Work Eighth Edition by Tay Vaughan, McGraw-Hill Osborne Media; 8th Edition (October 29, 2010). ISBN-10: 0071748466
- Fundamentals of Multimedia by Z. M. Li and M. S. Drew, Prentice Hall (2004), ISBN: 0-13-127256-X

Reference Material:

- Digital Multimedia by N. Chapman and J. Chapman. 2nd Edition, Wiley (2004). ISBN: 0-470-85890-7
- The Technology of Video and Audio Streaming by David Austerberry, Focal Press; 2nd Edition (2004). ISBN-10: 0240805801
- Multimedia Security: Watermarking, Steganography, and Forensics by Frank Y. Shih, CRC Press; 1st Edition (2012). ISBN-10: 1439873313
- Multimedia Computing by Daniel Cunliffe and Geoff Elliott, Lexden Publishing Ltd. (2005). ISBN-10: 1904995055
- Multimedia Foundations: Core Concepts for Digital Design by Vic Costello, Ed Youngblood and Susan Youngblood, Focal Press; 1st Edition (2012). ISBN-10: 0240813944

Course Title: Web Engineering
Course Code: CS-4513
Course Structure: Lectures: 3/Labs: 0
Credit Hours: 3
Prerequisites:CS-3548 (Web Systems and Technologies)
Course Objectives:
The course is aimed to provide students with conceptual understanding required to develop web applications and web services according to international standards.

Course Syllabus:
An Introduction to Web Engineering.Requirements Engineering for Web Applications.Web Applications Modeling.Web Application Architectures. Technology-away Web Application Design. Technologies for Web Applications.Testing Web Applications.Operation and Maintenance of Web Application.Web Project Management.Web Application Development Process.Usability of Web Applications.Performance of Web Applications.Security for Web Applications.The Semantic Web.

Course Outline:

1. An Introduction to Web Engineering: Categories of Web Applications, Characteristics of Web Applications.
2. Requirements Engineering for Web Applications: Fundamentals of RE, RE Specifics in Web Engineering, Principles for RE of Web Applications, Adapting RE Methods to Web Application Development. [TB: Ch. 2]
3. Web Applications Modeling: Fundamentals of WAM, Modeling Specifics in Web Engineering, Modeling Requirements, Content Modeling, Hypertext Modeling,

Presentation Modeling, Customization Modeling, Methods and Tools. [TB: Ch. 3]

4. Web Application Architectures:Fundamentals of WAA, Specifics of WAA, Components of a Generic AA, Layered Architecture, Data-aspect Architectures. [TB: Ch. 4]
5. Technology-away Web Application Design: Web Design from an Evolutionary Perspective, Presentation Design, Interaction Design, Functional Design, Outlook. [TB: Ch. 5]
6. Technologies for Web Applications: Fundamentals, Client/Server Communication on the Web, Client-side Technologies, Document-specific Technologies, Server-side Technologies. [TB: Ch. 6]
7. Testing Web Applications: Test Web Applications: Fundamentals, Test Specifics in Web Engineering, Test Approaches, Test Scheme, Test Methods and Techniques, Test Automation. [TB: Ch. 7]
8. Operation and Maintenance of Web Application: Introduction, Challenges Following the Launch of A Web Application, Promoting a Web Application, Content Management, Usage Analysis. [TB: Ch. 8]
9. Web Project Management: Project Management to Web Project Management, Challenges in WPM, Managing Web Team, Managing the Development Process. [TB: Ch. 9]
10. Web Application Development Process: Fundamentals, Requirements for a Web Application Development Process, Analysis of the Rational Unified Development Process, Analysis of Extreme Programming. [TB: Ch. 10]
11. Usability of Web Applications: What is Usability, Characteristics of Web Application Usability, Design Guidelines, Web Usability Engineering Methods, Web Usability standards, Web Usability Engineering Trends. [TB: Ch. 11]
12. Performance of Web Applications: What is Performance, Characteristics of Web Applications Performance, System Definition and Indicators, Characterizing the Workload, Analytical Techniques, Representing and Interpreting Results, Performance Optimization Methods. [TB: Ch. 12]
13. Security for Web Applications: Introduction, Aspects of Security, Encryption, Digital Signatures and Certificates, Secure Clients/Server-Interaction, Client Security Issue, Service Provider Security Issues. [TB: Ch. 13]
14. The Semantic Web: Fundamentals, Technological Concepts, Specifics of Semantics Web Applications, Tools. [TB: Ch. 14]

Textbook(s):

- Web Engineering: The Discipline of Systematic Development of Web Applications by GertiKappel, Birgit Pr ¨ oll, Siegfried Reich,WernerRetschitzegger, Springer; Softcover reprint of hardcover 1st Edition. 2008 Edition (December 10, 2010). ISBN-10: 184996677X

Reference Material:

- Web Engineering by Emilia Mendes and Nile Mosley, Springer; Softcover reprint of hardcover 1st Edition. 2006 Edition (November 9, 2010). ISBN-10: 3642066453
- Web Engineering: A Practioner's Approach by Roger Pressman and David Lowe, McGraw-Hill Science/Engineering/Math; 1st Edition (January 22, 2008). ISBN-10: 0073523291
- Web Application Architecture: Principles, Protocols and Practices by Leon Shklar and

Rich Rosen, Wiley; 2nd Edition (May 5, 2009). ISBN-10: 047051860X

- Web Engineering by Emilia Mendes and Nile Mosley, Springer; Softcover reprint of hardcover 1st Ed. 2006 Edition (November 9, 2010). ISBN-10: 3642066453
- Web Engineering: Modelling and Implementing Web Applications by Gustavo Rossi, Oscar Pastor, Daniel Schwabe, and Luis Olsina, Springer; Softcover reprint of hardcover 1st Edition. 2008 Edition (December 10, 2010). ISBN-10: 184996677X
- W3C Online Resources

Course Title: Semantic Web Techniques
Course Code: CS-4747
Course Structure: Lectures: 3/Labs: 0
Credit Hours: 3
Prerequisites: None
Course Objectives:
The Semantic Web is a W3C Activity for representing information in the World Wide Web in a machine-readable fashion: such that it can be used by machines not just for display purposes, but for automation, integration, and reuse across applications. This course introduces techniques that are useful stand-alone and can be integrated for building a semantic web.

Course Syllabus:
The Semantic Web Vision.Structured Web Documents in XML.Web Resources in RDF, Metadata with RDF, Metadata taxonomies with RDF Schema.Web Ontology Language: OWL. Logic and Inference: Rules. Semantic Web Applications. Ontology Engineering

Course Outline:

1. The Semantic Web Vision
2. Structured Web Documents in XML
3. Web Resources in RDF, Metadata with RDF, Metadata taxonomies with RDF Schema
4. Web Ontology Language: OWL
5. Logic and Inference: Rules
6. Applications
7. Ontology Engineering

Textbook(s):

- A Semantic Web Primer by Grigoris Antoniou, Paul Groth, Frank van vanHarmelen, andRinke Hoekstra, The MIT Press; third edition edition (August 24, 2012). ISBN-10: 0262018284

Reference Material:

- Programming the Semantic Web by Toby Segaran, and Colin Evans, O'Reilly Media; 1 edition (July 21, 2009). ISBN-10: 0596153813
- Semantic Web for the Working Ontologist, Second Edition: Effective Modeling in RDFS and OWL, Morgan Kaufmann; 2 edition (June 3, 2011). ISBN-10: 0123859654
- W3C Online Resources

Course Title: Mobile Computing
Course Code: CS-4545
Course Structure: Lectures: 3/Labs: 0
Credit Hours: 3
Prerequisites:CS-3548 (Web Systems and Technologies)
Course Objectives:
The course is aimed to prepare students to grasp the concepts and features of mobile computing technologies and applications.

Course Syllabus:
Introduction to Mobile Computing, Architecture of Mobile Software Applications, Mobile Development Frameworks and Tools.Creating Consumable Web Services for Mobile Devices.Memory Management.Mobile Applications.Mobile User-Interface Design.Dynamic Linking.Concurrency.Managing Resources. Introduction to Mobile Application Development with Andriod. Introduction to Mobile Application Development with IOS. Introduction to Mobile Application Development with Windows Phone. Introduction to Mobile Application Development with Blackberry.

Course Outline:
1. Introduction to Mobile Computing, Architecture of Mobile Software Applications, Introduction to Mobile Development Frameworks and Tools. [TB2: Ch. 1,2]
2. Creating Consumable Web Services for Mobile Devices: Intro to Web Services, Web Services Languages (Formats), Creating and Debugging Web Services [TB2: Ch. 3].
3. Memory Management: Design Patterns for Limited Memory, Strategies for Allocating Variable to Memory, Memory Management in Mobile Java, Symbian OS Memeory Management.[TB1]
4. Mobile Applications: Components of Mobile Application, Workflow for Application Development, Techniques for Composing Application, Application Models in Mobile Java, Symbian OS Application Infrastructure. [TB1]
5. Mobile User-Interface Design: Effective Use of Screen, Understanding Mobile Application Users, Understanding Mobile Information Design, Understanding Mobile Platforms, Using the Tools of Mobile Interface Design. [TB 2: Ch. 4]
6. Dynamic Linking: Introduction to DLL, Implementation Techniques & Plugins, Managing Memory in DLL, Rules of Thumb for Using DLL, Mobile Java and Dynamic Linking, Symbian OS Dynamic Libraries. [TB1]
7. Concurrency: Introduction, Infrastructure for Concurrent Programming, Faking Concurrency, MIDP Java and Concurrency, Symbian OS and Concurrency. [TB1]
8. Managing Resources: Resource-Related Concerns in Mobile Devices, Common Concerns, MIDP Java, Symbian OS. [TB1]
9. Security: Secure Coding and Design, Infrastructure for Enabling Secure Execution, Security Features in MIDP Java, Symbian OS Security. [TB1]
10. Introduction to Mobile Application Development with Andriod [TB2: Ch. 6]
11. Introduction to Mobile Application Development with IOS [TB2: Ch. 7]
12. Introduction to Mobile Application Development with Windows Phone [TB2: Ch. 8]
13. Introduction to Mobile Application Development with Blackberry [TB2: Ch. 9]

Textbook(s):

1. Programming Mobile Devices: An Introduction for Practitioners by TommiMikkonen, Wiley; 1st Edition (March 19, 2007). ISBN-10: 0470057386.
2. Professional Mobile Application Development by Jeff McWherter& ScottGowell, Wrox; 1st Edition (September 4, 2012). ISBN-10: 1118203909

Reference Material:

- Mobile Computing Principles: Designing and Developing Mobile Applications with UML and XML by Reza B'Far and Roy T. Fielding, Cambridge University Press (2004). ISBN-10: 0521817331.
- Mobile Design and Development: Practical concepts and techniques for creating mobile sites and web apps (Animal Guide) by Brian Fling, O'Reilly Media; 1st Edition (2009). ISBN-10: 0596155441.
- Fundamentals of Mobile and Pervasive Computing by Frank Adelstein, Sandeep KS Gupta, Golden Richard III and Loren Schwiebert, McGraw-Hill Professional; 1st Edition (2004). ISBN-10: 0071412379.
- Mobile Design Pattern Gallery: UI Patterns for Mobile Applications by Theresa Neil. O'Reilly Media (2012). ISBN-10: 1449314325.
- Programming Android: Java Programming for the New Generation of Mobile Devices by ZigurdMednieks, Laird Dornin, G. Blake Meike and Masumi Nakamura, O'Reilly Media; 2nd Edition (2012). ISBN-10: 1449316646.
- Beginning Android 4 Application Development by Wei-Meng Lee, Wrox; 1st Edition (March 6, 2012). ISBN-10: 1118199545

Course Title: Data Warehousing
Course Code: CS-4441
Course Structure: Lectures: 3 / Labs: 0
Credit Hours: 3
Prerequisites: CMP-3450 (Database Systems)
Course Syllabus:

Introduction to Data Warehousing, Data Warehouse System Lifecycle, Analysis and Reconciliation of Data Sources, User Requirement Analysis, Conceptual Modeling, Conceptual Design, Workload and Data Volume, Logical Modeling, Logical Design, Data-staging Design, Indexes for the Data Warehouse, Physical Design, Data Warehouse Project Documentation, Case Studies, Tools for Data Warehousing: MS SQL and Teradata.

Course Outline:

1. Introduction to Data Warehousing: Brief History, Characteristics, Architecture, Data Staging and ETL, Multidimentional Model, Meta-data, Accessing Data Warehouse, ROLAP, MOLAP, and HOLAP. [TB1: Ch. 1]
2. Data Warehouse System Lifecycle: Risk Factors, Top-Down vs Bottom-Up, Data Mart Design Phases, Methodological Framework – Data-Driven, Requirement-Driven; Testing Data Marts. [TB1: Ch. 2]
3. Analysis and Reconciliation of Data Sources: Inspecting and Normalization Schemata, Integration Problems, Integration Phases, Defining Mapping. [TB: Ch. 3]
4. User Requirement Analysis: Interviews, Glossary-based Requirement Analysis, Additional Requirements. [TB: Ch. 4]

5. Conceptual Modeling: Dimensional Fact Model, Events and Aggregation, Temporal Aspects, Overlapping Fact Shcemata, Formalizing the Dimensional Fact Model. [TB: Ch. 6]
6. Conceptual Design: ER Schema-based Design, Relational Schema-based Design, XML Schema-based Design, Mixed-approach Design. Requirement-driven Approach Design. [TB: Ch. 6]
7. Workload and Data Volume [TB1: Ch. 7]
8. Logical Modeling: MOLAP and HOLAP Systems, ROLAP Systems, Views, Temporal Scenarios. [TB1: Ch. 8]
9. Logical Design: From Fact Schemata to Start Schemata, View Materialization, View Fragmentation. [TB1: Ch. 9]
10. Data-staging Design: Population Reconciled Databases, Cleansing Data, Populating Dimensional Tables, Populating Fact Tables, Populating Materialized View
11. Indexes for the Data Warehouse: B*-Tree Indexes, Bitmap Indexes, Projection Indexes, Join & Star Indexes, Spatial Indexes, Join-Algorithm. [TB1: Ch. 11]
12. Physical Design: Optimizers, Index Selection, Splitting a Database into Tablespaces, Allocating Data Files, Disk Block Size. [TB1: Ch. 12]
13. Data Warehouse Project Documentation: Data Warehouse Levels, Data Mart Level, Fact Level
14. Case Studies, Tools for Data Warehousing: MS SQL and Teradata

Textbook(s):

- Data Warehouse Design: Modern Principles and Methodologies by MatteoGolfarelli and Stefano Rizzi, McGraw-Hill Osborne Media; 1st Edition (May 26, 2009). ISBN-10: 0071610391

Reference Material:

- Building the Data Warehouse by William H. Inmon, Wiley; 4th Edition (2005). ISBN-10: 0764599445
- The Data Warehouse Lifecycle Toolkit : Expert Methods for Designing, Developing, and Deploying Data Warehouses by Ralph Kimball, Laura Reeves, Margy Ross and Warren Thornthwaite, Wiley (August 13, 1998). ISBN-10: 0471255475
- Data Warehousing Fundamentals for IT Professionals by PaulrajPonniah, Wiley; 2nd Edition (2010). ISBN-10: 0470462078
- Data Mining and Data Warehousing: Practical Machine Learning Tools Techniques by Ram Kumar Singh and AmitAsthana, LAP LAMBERT Academic Publishing (2012). ISBN-10: 3659118419

Course Title: Data Mining
Course Code: CS-4442
Course Structure: Lectures: 3 / Labs: 0
Credit Hours: 3
Prerequisites: CMP-3450 (Database Systems)
Course Objectives:

The course introduces students with basic applications, concepts, and techniques of data mining and to develop their skills for using recent data mining software to solve practical problems in a variety of disciplines.

Course Syllabus:

Data-Mining Concepts, Preparing the Data, Data Reduction, Learning From Data, Statistical Methods, Decision Trees and Decision Rules, Artificial Neural Networks, Ensemble Learning, Cluster Analysis, Association Rules, Web Mining and Text Mining, Genetic Algorithms, Fuzzy Sets and Fuzzy Logic, Visualization Methods, Data Mining Tools: Weka, CBA and Yale, etc.

Course Outline:

1. Data-Mining Concepts: Introduction, Data-Mining Process, Large Data Sets, Data Warehouses for Data Mining, Business Aspects Data Mining. [TB1: Ch. 1]
2. Preparing the Data: Raw Data- Representation, Characteristics, Transformation; Missing Data, Time-Dependent Data, Outlier Analysis. [TB1: Ch. 2]
3. Data Reduction: Dimensions of Large Data Sets, Feature Reduction, Relief Algorithm, Entropy Measure for Ranking Features, PCA, Value Reduction, Feature Discretization: ChiMerge Technique, Case Reduction. [TB1: Ch. 3]
4. Learning From Data: Learning Machine, SLT, Types of Learning Methods, Common Learning Tasks, SVMs, kNN: Nearest Neighbor Classifier, Model Selection versus Generalization, Model Estimation. [TB1: Ch. 4]
5. Statistical Methods: Statistical Inference, Assessing Differences in Data Sets, Bayesian Inference, Predictive Regression, ANOVA, Logistic Regression, Log-Linear Models, LDA. [TB1: Ch. 5]
6. Decision Trees and Decision Rules: Decision Trees, Generating & Pruning Decision Tree, CART Algorithm &Gini Index, Limitations of Decision Trees and Decision Rules. TB1: Ch. 6]
7. Artificial Neural Networks: Model of an Artificial Neuron, Architectures of ANNs, Learning Process, Learning Tasks Using ANNs, Multilayer Perceptrons, Competitive Networks and Competitive Learning, SOMs. [TB1: Ch.7]
8. Ensemble Learning: Ensemble-Learning Methodologies, Combination Schemes for Multiple Learners, Bagging and Boosting, AdaBoost. [TB: Ch. 8]
9. Cluster Analysis: Clustering, Similarity Measures, Agglomerative Hierarchical Clustering, Partitional Clustering, Incremental Clustering, DBSCAN Algorithm. BIRCH Algorithm, Agglomerative Hierarchal and Partition Clustering Algorithms, Clustering Validation. [TB: Ch. 9]
10. Association Rules: Market-Basket Analysis, Algorithm Apriori, From Frequent Itemsets to Association Rules, Improving the Efficiency of the Apriori Algorithm, FP Growth Method, Associative-Classification Method, Multidimensional Association–Rules Mining. [TB: Ch. 10]
11. Web Mining and Text Mining: Web Mining, Web Content, Structure, and Usage Mining, HITS and LOGSOM Algorithms, Mining Path–Traversal Patterns, PageRank Algorithm, Text Mining, Latent Semantic Analysis. [TB: Ch. 11]
12. Genetic Algorithms: Fundamentals of GAs, Optimization Using GAs, Schemata, TSP, Machine Learning Using GAs, GAs for Clustering. [TB: Ch. 13]
13. Fuzzy Sets and Fuzzy Logic: Fuzzy Sets, Fuzzy-Set Operations, Extension Principle and Fuzzy Relations, Fuzzy Logic and Fuzzy Inference Systems, Multifactorial Evaluation, Extracting Fuzzy Models from Data, Data Mining and Fuzzy Sets
14. Visualization Methods: Perception and Visualization, Scientific Visualization and Information Visualization, Parallel Coordinates, Radial Visualization, Visualization Using Self-Organizing Maps, Visualization Systems for Data Mining

15. Data Mining Tools: Weka, CBA and Yale, etc.

Textbook(s):

- Data Mining: Concepts, Models, Methods, and Algorithms by MehmedKantardzic. Wiley-IEEE Press; 2nd Edition (August 16, 2011). ISBN-10: 0470890452

Reference Material:

- Data Mining: Concepts and Techniques, Third Edition (The Morgan Kaufmann Series in Data Management Systems) by Jiawei Han, MichelineKamber and Jian Pei, Morgan Kaufmann; 3rd Edition (2011).ISBN-10: 0123814790
- Principles of Data Mining (Adaptive Computation and Machine Learning) by David J. Hand, HeikkiMannila and Padhraic Smyth, A Bradford Book (August 1, 2001). ISBN-10: 026208290X
- Data Mining and Data Warehousing: Practical Machine Learning Tools Techniques by Ram Kumar Singh and AmitAsthana, LAP LAMBERT Academic Publishing (2012). ISBN-10: 3659118419
- Information-Statistical Data Mining: Warehouse Integration with Examples of Oracle Basics (The Springer International Series in Engineering and Computer Science) by Bon K. Sy and Arjun K., Springer; 1st Edition (2003). ISBN-10: 1402076509
- Building the Data Warehouse by William H. Inmon, Wiley; 4th Edition (2005).ISBN-10: 0764599445

Course Title: Business Intelligence and Analytics

Course Code: CS-4443

Course Structure: Lectures: 3 / Labs: 0

Credit Hours: 3

Prerequisites: CS-4441 (Data Warehousing)

Course Objectives:

The course will enhance students' understanding regarding the evolution, need and benefits of business intelligence. Students will also learn about various technical aspects of BI and understand the processes involving in planning, designing, building and maintaining BI environment.

Course Syllabus:

Business Intelligence Introduction, BI Environment, Business Process and Information Flow, Data Requirements Analysis, Data Warehouses and the Technical BI Architecture, Data Profiling, Business Rules, Data Quality, Data Integration, Deriving Insight from Data, Knowledge Discovery & Delivery, BI User Types and Reports, Installations, Configuring and Maintaining the BI Server, Creating Repositories from Relational Sources, Creating Repositories from OLAP Data Sources, Creating Reports Using Answers and Dashboards.

Course Outline:

1. Business Intelligence - An Introduction, Value Drivers, Performance Metrics and Key Performance Indicators, Use Cases for BI. [TB: Ch. 1, 2]
2. BI Success Factors. Strategic Versus Tactical Planning, BI Strategy and Plan. [TB: Ch. 3,4]
3. BI Environment, BI and Analytics Platform and Strategy, Organizational BI Framework,

Services & Systems Evaluation. [TB: Ch. 5]

4. Business Process and Information Flow: Information Need & Flow, Information Processing & Information Flow, Information Flow Model, Modeling Frameworks. [TB: Ch. 6]
5. Data Requirements Analysis: Business Uses of Information, Metrics: Facts, Qualifiers, and Models, Defining Business Rules, Data Requirement Analysis, Assessing Suitability. [TB: Ch. 7]
6. Data Warehouses and the Technical BI Architecture: Data Modeling and Analytics, Analytical Platforms, Operational Data Stores. Business Metadata: What is Metadata? Types of Metadata, Semantics Metadata Processes for Business Analytics. [TB: Ch. 8, 9]
7. Data Profiling: Data Sources, Data Profiling Activities, Data Model Inference, Attribute Analysis, Relationship Analysis, Management Issues. [TB: Ch. 10]
8. Business Rules: The Value of Proposition of Business Rules, The Business Rules Approach, Defining Business Rules, Business Rule Systems, Sources of Business Rules, Management Issues. [TB: Ch. 11]
9. Data Quality: Virtuous Cycle of Data Quality, Types of Data Flow, Business Impacts of Data Flow, Dimensions of Data Quality, Data Quality Assessment, Data Quality Rules, Data Quality Monitoring and Improvement, Data Quality for Business Analytics, Data Cleansing. [TB: Ch. 13]
10. Data Integration: Improving Data Accessibility, Extracting/ Transformation/Loading, Data Latency and Data Synchrony, Data Replication and Change Data Capture, Data Integration and Cloud Computing, Information protection, Merge/Purge and Record Consolidation. [TB: Ch. 13]
11. Deriving Insight from Data: Customer Profiles, Behavior, and Lifetime Value; Demographics, Psychographics, Geographic; Geographic Data, Behavior Analysis. [TB: Ch. 15, 16]
12. Knowledge Discovery & Delivery: Business Drivers, KD Virtuous Cycle, Direct Versus Unidirectional Knowledge Discovery, Data Mining Activities, Data Mining Techniques. [TB: Ch. 17]
13. BI User Types, Standards Reports, Interactive Analysis and Ad Hoc Querying, Parameterized Reports and Self-Service Reporting, Dimensional Analysis, Alerts/ Notifications, Visualizations, Scorcards and Dashboards, Geographical Visualizations, Integrated Analysis. [TB: Ch. 18]
14. Installations, Configuring and Maintaining the BI Server, Creating Repositories from Relational Sources, Creating Repositories from OLAP Data Sources, Creating Reports Using Answers and Dashboards.

Text Book(s):

- Business Intelligence by David Loshi, Morgan Kaufmann; 2nd Edition (October 31, 2012). ISBN-10: 0123858895

Reference Material:

- Oracle Business Intelligence 11g Developers Guide by Mark Rittman, McGraw-Hill Osborne Media; 1st Edition (September 18, 2012). ISBN-10: 0071798749
- Delivering Business Intelligence with Microsoft SQL Server 2012 3/E by Brian Larson, McGraw-Hill Osborne Media; 3rd Edition (March 16, 2012). ISBN-10: 0071759387
- Business Intelligence by Elizabeth Vitt, Michael Luckevich, and StaciaMisner, Microsoft Press (December 22, 2008). ISBN-10: 073562660X

- The Data Warehouse Mentor: Practical Data Warehouse and Business Intelligence Insights, by Robert Laberge, 1st Edition, McGraw-Hill Companies, (2012). ASIN: B008UYJJ8C
- Business Intelligence: A Managerial Approach by Turban, Sharda, Delen, King, 2nd Edition, Prentice Hall (2011). ISBN: 13-978-0-136-10066-9
- Business Intelligence in Plain Language: A practical guide to Data Mining and Business Analytics by Jeremy Kolb, Applied Data Labs Inc. (2012). ASIN: B009K7INOY

Course Title: Database Administration & Management
Course Code: CS-3441
Course Structure: Lectures: 3/Labs: 0
Credit Hours: 3
Prerequisites: CMP-3450 (Database Systems)
Course Objectives:

- Make Students fully understand the concepts and technical issues of Database Administration.
- Make Students to have good understanding of internal functionality of Database Management System and can Administrator Huge Database implemented in a DBMS.
- They Should Perform Database Administration tasks i.e. Backup and Recovery and Performance Tuning of Databases.

Course Syllabus:
Installation; SQL* Plus; Oracle Enterprise Manager; DBA Tools. Oracle Architectural Components: Oracle Server. Oracle Instance.Physical Structure.SGA.Shared Pool.Library Cache.Data Dictionary Cache.Large Pool.Processes.Managing Oracle Instances.Startup and Shutdown Database.Managing Files.Creating Database and Data dictionary.Managing Tablespaces.Operations with Tablespaces. Data File Management, Segments, Block. Managing Undo Data, Undo Data Statistics. Managing Tables and Users. Indexes Management, Maintaining Data Integrity, Constraints.Managing Privileges.Basic Oracle Net Architecture.Server Side Configuration.Client Side Configuration. Usage and Configuration of Oracle Shared Server. Backup and Recovery. Sizing Shared Pool, Sizing Buffer Cache, I/O Issues. Tuning Rollback Segments. Tuning Shared Servers, Types of Locks, Block Efficiency, Storage hierarchy, Avoiding Dynamic allocation, Statistics, PCTFREE and PCTUSED, Monitoring Index Usage.

Course Outline:

1. Installation; SQL* Plus; Oracle Enterprise Manager; DBA Tools. Oracle Architectural Components: Oracle Server; Oracle Instance.
2. Physical Structure; SGA; Shared Pool; Library Cache; Data Dictionary Cache; Large Pool; User Process; Server Process; Background Processes.
3. Managing an Oracle Instance: Parameter File; Creating SPFILE; Oracle Managed Files; Startup and Shutdown Database; Alert Log File; Background Trace File; User Trace File.
4. Creating Database and Data dictionary.
5. Managing Control Files and Redo Log Files.
6. Managing Tablespaces, Operations with Tablespaces.

7. Data File Management, Segments, Block.
8. Managing Undo Data, Undo Data Statistics: Managing Tables and Users:
9. Indexes Management, Maintaining Data Integrity, Constraints. Managing Privileges.
10. Basic Oracle Net Architecture: Types of Networks, Oracle Net Services, Oracle Shared Server, Connection Manager, Oracle Net Connections.
11. Server Side Configuration: The Listener Process; Configuring Listener, Sessions, Creating and Managing Listener.
12. Client Side Configuration: Host Naming Method, Local Naming Method, Net Assistant, Configurations. Usage and Configuration of Oracle Shared Server.
13. Backup and Recovery, Instance and Media Recovery, Configuration of Archive log mode, User Managed Complete Recovery, Loading Data into Database, Tuning Tools. Sizing Shared Pool, Sizing Buffer Cache, I/O Issues.
14. Tuning Rollback Segments, Latches, Rollback Segment Tuning Shared Servers, Types of Locks, Block Efficiency, Storage hierarchy, Avoiding Dynamic allocation, Statistics, PCTFREE and PCTUSED, Monitoring Index Usage.

Textbook(s):

- Oracle Database 11g DBA Handbook by Bob Bryla and Kevin Loney, McGraw-Hill Osborne Media; 1st Edition (December 6, 2007). ISBN-10: 0071496637
- Database Administration: The Complete Guide to DBA Practices and Procedures by Craig S. Mullins, Addison-Wesley Professional; 2nd Edition (October 21, 2012). ISBN-10: 0321822943

Reference Material:

- Database Systems: A Practical Approach to Design, Implementation and Management by Thomas M. Connolly and Carolyn E. Begg, Addison-Wesley; 5th Edition (2009). ISBN-10: 0321523067
- Oracle Database 11g The Complete Reference by Kevin Loney, McGraw-Hill Osborne Media; 1st Edition (2008). ISBN-10: 0071598758
- Oracle Database 11g Release 2 Performance Tuning Tips & Techniques (Oracle Press) by Rich Niemiec, McGraw-Hill Osborne Media; 1st Edition (2012). ISBN-10: 0071780262
- Online Material URL http://otn.oracle.com

Course Title: Advance Database Management
Course Code: CS-4444
Course Structure: Lectures: 3 / Labs: 0
Credit Hours: 3
Prerequisite:CS-3450 (Database Systems)
Course Objectives:
The students will learn about the salient features of various types of databases, transaction management, data warehousing and data mining

Course Syllabus:
PL/SQL Basics.Programmatic SQL – Embedded SQL, Dynamic SQL, and ODBC Standard. Transaction processing and concurrency control. Object-based databases and XML Object-based databases.Data warehousing.Data Warehousing Design.OLAP and Data Mining On-line Analytical Processing.Database Security.PL/SQL Security.

Course Outline:

1. PL/SQL – Introduction To PL/SQL – Declare, Begin Statements, Variables, Control Structure, PL/SQL Transactions – Savepoint, Cursor, PL/SQL Database Objects – Procedures, Functions, Packages, Triggers. Programmatic SQL – Embedded SQL, Dynamic SQL, And ODBC Standard.
2. Transaction Processing And Concurrency Control Definition Of Transaction And ACID Properties. Transaction Processing - Transaction-Processing Monitors, Transactional Workflows, Main-Memory Databases, Real-Time Transaction Systems, Long-Duration Transactions, Transaction Management In Multi-Databases. Concurrency Control – Locks, Optimistic Concurrency Control (Backward and Forward Validations), Timestamping Concurrency Control.
3. Object-Based Databases And Xml Object-Based Databases – Complex Data Types, Structured Types and Inheritance In SQL, Table Inheritance, Array and Multiset Types in SQL, Objectidentity and Reference Types in SQL, Implementing O-R Features, Persistent
4. Programming Languages, OO Vs OR. XML – Structure of XML, Document Schema, Querying and Transformation, API In XML, XML Applications.
5. Data Warehousing: Introduction To Data Warehousing – Concepts, Benefits and Problems, DW Architecture – Operational Data, Load Manager, Meta Data, DW Data Flows – Inflow, Upflow, Meta Flow, DW Tools and Technologies – Extraction, Cleansing and Transformation Tools, DW DBMS, Admin and Management Tools, Data Marts – Reasons And Issues, Data Warehousing Using Oracle.
6. Data Warehousing Design – Designing, Dimensionality Modeling, Design Methodology, DW Deign Using Oracle.
7. OLAP And Data Mining On-Line Analytical Processing – OLAP Benchmarks, Applications, Benefits, Tools, Categories, Extensions To SQL, Data Mining – Introduction, Techniques, Predictive Modeling, Tools. Data Mining Algorithms – Apriori, Decision Tree, K-Means, Bayesian Classifier.
8. Database Security: Security and Integrity Threats, Defence Mechanisms, Statistical Database Auditing & Control. Security Issue Based On Granting/Revoking of Privileges, Introduction to Statistical Database Security. PL/SQL Security – Locks – Implicit Locking, Types And Levels of Locks, Explicit Locking, Oracles' Named Exception Handlers.

Textbook(s):

1. Database System Concepts by A. Silberschatz, H. Korth and S. Sudarshan, McGraw-Hill Science/Engineering/Math; 6th Edition (January 27, 2010). ISBN-10: 0073523321
2. Database Systems – A Practical Approach to Design, Implementation and Management by Thomas Connolly and Carolyn Begg, 5th Edition, ISBN-10: 0321601106.
3. SQL, PL/SQL – The Programming Language of ORACLE by Ivan Bayross, Third Revised Edition, BPB Publication.ISBN-10: 8176560723

Reference Material:

- Data Mining – Concepts and Techniques by Jiawei Han and MichelineKamber, Morgan Kaufmann; 3rd Edition (July 6, 2011). ISBN-10: 0123814790
- Handbook of Database Security- Application and Trends by M. Gertz, and S. Jajodia, 2008, Springer.
- Handbook of Database Security: Applications and Trends by Michael Gertz (Editor) and

SushilJajodia (Editor), Springer; Softcover reprint of hardcover 1st Edition (November 4, 2010). ISBN-10: 1441943056

Course Title: Business Process Management
Course Code: IT- 4365
Course Structure: Lectures: 3 / Labs: 0
Credit Hours: 3
Prerequisites: None
Course Objectives:
The course will cover topics fundamentals and principles of Business Process Management. The course is designed to achieve following objectives:

- Understand the key Terms and concepts in BPM
- Learn the major methodologies and techniques for implementing BPM
- Discover the various technologies that support BPM
- Learn what a BPM management and process-centric organization is and how it
- works
- Understand the metrics and measurements critical to managing processes
- Learn how to identify critical processes

Course Syllabus:
Introduction d BPM, Motivation and Definitions, Business Process Lifecycle, Classification of Business Processes, Goals, Structure, and Organization.Evolution of Enterprise Systems Architectures.Business Process Modeling.Process Orchestrations. Process Choreographies. Modeling in BPMN.Properties of Business Processes. Workflow Management Architectures, Flexible Workflow Management, Web Services and their Composition, Advanced Service Composition, Data-Driven Processes. Business Process Management Methodology.

Course Outline:
1. Introduction: Motivation and Definitions, Business Process Lifecycle, Classification of Business Processes, Goals, Structure, and Organization. [TB: Ch. 1]
2. Evolution of Enterprise Systems Architectures: Traditional Application Development, Enterprise Applications and their Integration, Enterprise Modeling and Process Orientation, Workflow Management, Enterprise Services Computing. [TB: Ch. 2]
3. Business Process Modeling: Foundation, Conceptual Model and Terminology, Abstraction Concepts, From Business Functions to Business Processes, Activity Models and Activity Instances, Process Models and Process Instances, Process Interactions, Modeling Process Data, Modeling Organization, Modeling Operation, Business Process Flexibility, Architecture of Process Execution Environments. [TB: Ch. 3]
4. Process Orchestrations: Control Flow Patterns, Petri Nets, Event-driven Process Chains, Workflow Nets, Graph-Based Workflow Language, Business Process Model and Notation. [TB: Ch. 4]
5. Process Choreographies: Motivation and Terminology, Development Phases, Process Choreography Design, Process Choreography Implementation, Service Interaction

Patterns, Choreography Modeling in BPMN. [TB: Ch. 5]

6. Properties of Business Processes: Data Dependencies, Object Lifecycle Conformance, Structural Soundness, Soundness, Relaxed Soundness, Weak Soundness, Lazy Soundness, Soundness Criteria Overview. [TB: Ch. 6]
7. Business Process Management Architectures: Workflow Management Architectures, Flexible Workflow Management, Web Services and their Composition, Advanced Service Composition, Data-Driven Processes: Case Handling. [TB: Ch. 7]
8. Business Process Management Methodology: Dependencies between Processes, Methodology Overview, Phases in Detail. [TB: Ch. 7]

Textbook(s):

1. Business Process Management: Concepts, Languages, Architectures by Mathias Weske, Springer; 2nd Edition (May 3, 2012). ISBN-10: 3642286151.
2. Business Process Management Common Body Of Knowledge by Yvonne LedererAntonucci, et. al., CreateSpace Independent Publishing Platform (March 8, 2009). ISBN-10: 1442105666

Reference Material:

- Process Management: A Guide for the Design of Business Processes by Jörg Becker, Martin Kugeler and Michael Rosemann, Springer; 2nd Edition (January 21, 2011). ISBN-10: 3642151892
- Business Process Management, Second Edition: Practical Guidelines to Successful Implementations by John Jeston and Johan Nelis, Butterworth-Heinemann; 2nd Edition (March 24, 2008). ISBN-10: 0750686561
- Process Management: Practical Guidelines to Successful Implementation by T.S. Malik, Global India Publications Pvt Ltd; 1st Edition (December 31, 2009). ISBN-10: 9380228368
- Business Process Management: Practical Guidelines to Successful Implementations by John Jeston& Johan Nelis, Butterworth-Heinemann; 2nd Edition (March 24, 2008). ISBN-10: 0750686561
- BPMN Method and Style with BPMN Implementer's Guide: A structured approach for business process modeling and implementation using BPMN 2.0 by Bruce Silver, Cody-Cassidy Press (October 17, 2011). ISBN-10: 0982368119
- Workflow Modeling: Tools for Process Improvement and Application Development by Alec Sharp and Patrick McDermott, Artech House; 2nd Edition (October 31, 2008). ISBN-10: 1596931922
- Process Analysis and Improvement: Tools and Techniques by Seppanen, Marvic S., Kumar, Sameer & Chandra, Charu (2005). McGraw-Hill
- Business Process Change: A Guide for Business Managers and BPM and Six Sigma Professionals (The MK/OMG Press) by Paul Harmon and Business Process Trends, Morgan Kaufmann; 2nd Edition (July 27, 2007). ISBN-10: 0123741521

Course Title: Knowledge Management
Course Code: CS-4861
Course Structure: Lectures:3 / Labs: 0
Credit Hours: 3
Prerequisites: None
Course Objectives:

By the end of the course, students should be able to:

- Appraise current thought on knowledge management in the light of contemporary debates on knowledge productivity, strategic capability and organizational learning;
- Apply theories of knowledge management relevant to current workplace practice;
- Apply the tools and techniques of knowledge management.

Course Syllabus:

History and paradigms of knowledge management.Types of knowledge. Knowledge Revolution, Globalization, Knowledge Economy, Knowledge Workers, Knowledge Artifacts, Knowledge Agents. Knowledge Management: Definitions, Knowledge management Cycles, Benefits of KM, Implications for KM, KM Core Competencies. KM Processes: Discovery/ Detection, Capture and Codification, Organization, Sharing, transfer, Acquisition, Verification, Utilization, Creation, Reuse. KM Frameworks and Models.KM Frameworks and Models.Knowledge Capture and Codification.Knowledge Codification.Knowledge Taxonomies.Relationships among Knowledge Management, Competitive Intelligence, Business Intelligence, and Strategic Intelligence.Strategic and Practical Implications of Knowledge Capture and Codification.Knowledge Sharing and Communities of Practice.Knowledge Application.The Role of Organizational Culture.Knowledge Management Tools.Knowledge Management Strategy.The Value of Knowledge Management.Organizational Learning and Organizational Memory.The KM Team. The KM Profession, The Ethics of KM.

Course Outline:

1. History and paradigms of knowledge management; Types of knowledge: Explicit Knowledge, Tacit Knowledge, Embedded Knowledge, Embrained knowledge, Embodied knowledge, Encoded knowledge, Encultured knowledge; Organizational Internal & External Knowledge; Managers' Knowledge; Personal knowledge. Knowledge Economy: Knowledge Revolution, Globalization, Knowledge Economy, Knowledge Workers, Knowledge Artifacts, Knowledge Agents; Knowledge Management: Definitions, Knowledge management Cycles, Benefits of KM, Implications for KM, KM Core Competencies. [TB1: Ch. 1, 2, 4]
2. KM Processes: Knowledge Discovery/ Detection, Knowledge Capture and Codification, Knowledge Organization, Knowledge Sharing, Explicit Knowledge Sharing, Knowledge transfer, Knowledge Acquisition, Knowledge Verification, Knowledge Utilization, Knowledge Creation, Knowledge Reuse; [TB1: Ch. 3]
3. KM Frameworks and Models: The SECI Model, Alen Frost's Model, Boisot's KM Model, Hedlund's KM Model, Earl's KM Model, Carayannis's KM Model, Wiig's KM Model, Edvinsson's Model of Intellectual Capital, Snowden's KM Model, Inkpen&Dinur's KM Model. [TB1: Ch. 4]
4. KM Frameworks and Models: Van Buren's Model of IC Management, Bukowitz& Williams's KM Model, Gamble & Blackwell's KM Model, Demerest's KM Model, Frid's KM Model, Stankosky&Baldanza's KM Framework, Kogut& Zander's KM Model, Botha et. al. KM Model, Integrated Knowledge Management Model. [TB1: Ch. 4]
5. 4 Knowledge Capture and Codification: Tacit Knowledge Capture at the Individual, Group, and Organizational Levels, xplicit Knowledge Codification, Cognitive Maps,

Decision Trees, Knowledge Taxonomies, The Relationships among Knowledge Management, Competitive Intelligence, Business Intelligence, and Strategic Intelligence; Strategic and Practical Implications of Knowledge Capture and Codification [TB2: Ch. 4]

6. Knowledge Sharing and Communities of Practice: Sociograms and Social Network Analysis, Knowledge-Sharing Communities, Types of Communities, Roles and Responsibilities in CoPs, Knowledge Sharing in Virtual CoPs, Obstacles to Knowledge Sharing, Strategic and Practical Implications of Knowledge Sharing. [TB2: Ch. 5]
7. Knowledge Application: Knowledge Application at the Individual Level, Characteristics of Individual Knowledge Workers, Bloom ' s Taxonomy of Learning Objectives, Task Analysis and Modeling, Knowledge Application at the Group and Organizational Levels, Knowledge Reuse, Knowledge Repositories, E-Learning and Knowledge Management Application, Strategic & Practical Implications of Knowledge Application. [TB3: Ch.6]
8. The Role of Organizational Culture: Different Types of Cultures, Organizational Culture Analysis, The Effects of Culture on Individuals, Organizational Maturity Models, KM Maturity Models, CoP Maturity Models, Transformation to a Knowledge-Sharing Culture, Impact of a Merger on Culture, Impact of Virtualization on Culture, Strategic and Practical Implications of Organizational Culture. [TB2: Ch.7]
9. Knowledge Management Tools: Knowledge Capture and Creation Tools, Content Creation Tools, Data Mining and Knowledge Discovery, Blogs, Mashups, Content Management Tools, Folksonomies and Social Tagging/Bookmarking, Personal Knowledge Management (PKM), Knowledge Sharing and Dissemination Tools, Groupware and Collaboration Tools, Wikis, Social Networking, Web 2.0, and KM 2.0, Knowledge Acquisition and Application Tools, Intelligent Filtering Tools, Adaptive Technologies, Strategic and Practical Implications of KM Tools and Techniques. [TB2: Ch. 8]
10. Knowledge Management Strategy: Developing a Knowledge Management Strategy, Knowledge Audit, Gap Analysis, The KM Strategy Road Map, Balancing Innovation and Organizational Structure, Types of Knowledge Assets Produced. [TB2: Ch. 9]
11. The Value of Knowledge Management: KM Return on Investment (ROI) and Metrics, The Benchmarking Method, The Balanced Scorecard Method, The House of Quality Method, The Results-Based Assessment Framework, Measuring the Success of Communities of Practice. [TB2: Ch. 10]
12. Organizational Learning and Organizational Memory: How Do Organizations Learn and Remember? Frameworks to Assess Organizational Learning and Organizational Memory, The Management of Organizational Memory, Organizational Learning, The Lessons Learned Process, Organizational Learning and Organizational Memory Models, A Three-Tiered Approach to Knowledge Continuity. [TB2: Ch. 11]
13. The KM Team: Major Categories of KM Roles, Senior Management Roles, KM Roles and Responsibilities within Organizations, The KM Profession, The Ethics of KM. [TB2: Ch. 12]

Textbook(s):

- Essentials of Knowledge Management: Concepts, Theories and Practices by M. A. Pasha & S. Pasha, Innovators Knowledge Services (2012). ISBN:978-969-9791-04-8
- Knowledge Management In Theory And Practice by KimizDalkir, The MIT Press; 3nd

Edition (March 4, 2011). ISBN-10: 0262015080

Reference Material:

- The Knowledge Management Toolkit: Orchestrating IT, Strategy, and Knowledge Platforms by AmritTiwana, Prentice Hall; 2nd Edition (August 29, 2002). ISBN-10: 013009224X
- Principles of Knowledge Management: Theory, Practice and Cases by ElieGeisler and NilminiWickramasinghe, M.E.Sharpe (January 15, 2009). ISBN-10: 0765613220
- Knowledge Management: Concepts, Methodologies, Tools and Applications (6-volume set) by Murray E. Jennex, IGI Global; Reprint Edition (August 10, 2007). ISBN-10: 1599049333

Annexure-A

یونیورسٹی آف سرگودھا

SS-2311 - Islamic Studies

نصاب برائے اسلامیات لازمی کلاس BS 4 Years

باب اول: مطالعہ قرآن وحدیث

باب دوم: مطالعہ سیرت

باب سوم: مطالعہ تہذیب، وتمدن

باب اول: مطالعہ قرآن وحدیث (Topical Study of Quran & Hadith)

موضوعات

۱۔ توحید (دلائل کا عقلی ونقلی مطالعہ، تفکر وتدبر)

آیات:

۱. لله مافی السمٰوٰت وما فی الارض وان تبدوا مافی انفسکم او تخفوہ یحاسبکم به الله فیغفرلمن یشاء ویعذب من یشآء والله علٰی کل شئی قدیر. (البقرۃ:۲۸۴)

۲. الم تروا ان الله سخر لکم مافی السمٰوٰت وما فی الارض واسبغ علیکم نعمه ظاهرۃً و باطنۃً ومن الناس من یجادل فی الله بغیر علم ولا هدی ولا کتاب منیر. (لقمان:۲۰)

۳. ربنا لاتواخذنا ان نسینا او اخطانا ربنا ولا تحمل علینا اصرا کما حملته علی الذین من قبلنا ربنا ولا تحملنا مالا طاقة لنا به واعف عنا واغفرلنا وارحمنا انت مولانا فانصرنا علی القوم الکافرین (البقرۃ:۲۸۶)

۴. سنریهم ایاتنا فی الآفاق وفی انفسهم حتی یتبین لهم انه الحق اولم یکف بربک انه علی کل شیء شهید. (حٰم السجدۃ:۴۱)

ان فی خلق السمٰوٰت والارض و اختلاف اللیل والنهار لایٰت الاولی الالباب. (آل عمران:۱۹۰)

۵. الذین یذکرون الله قیاماً و قعوداً وعلی جنوبهم و یتفکرون فی خلق السمٰوٰت والارض ربنا ما خلقت هذا باطلاً، سبحانک فقنا عذاب النار. (آل عمران:۱۹۲)

احادیث

عن عمر بن الخطابؓ قال: قال رسول اللهﷺ حین سئل عن الایمان ان تومن بالله و ملائکته و کتبه ورسله والیوم الاخر و تومن بالقدر خیره و شره (متفق علیه)

۲: رسالت (الہامی کتب، وملائکہ پر ایمان، آداب نبوی، اطاعت رسول اور ختم نبوت)

آیات:

۱. امن الرسول بما انزل الیه من ربه والمومنون کل امن بالله و ملائکته ورسله لا نفرق بین احد من رسله وقالوا سمعنا واطعنا غفرانک ربنا والیک المصیر (البقرۃ:۲۸۵)

۲. یاایهاالذین امنوا لا تقدموا بین یدی الله ورسوله واتقوا الله ان الله سمیع علیم. (الحجرات:۱)

چیئرمین
شعبہ علوم اسلامیہ
یونیورسٹی آف سرگودھا

واخرى تحبونها نصر من الله وفتح قريب وبشر المؤمنين .(الصف: ۱۳)

احادیث

۱. عن ابن عمر قال: قال رسول الله ﷺ بنی الاسلام علی خمس شهادة ان لااله الا الله وان محمداعبده ورسوله واقام الصلوة وايتاء الزكوة والحج وصوم رمضان (متفق عليه)

۲. عن شرمة بن معبد قال: قال رسول الله ﷺ مروا الصبی الصلوة اذا بلغ سبع سنين واذا بلغ عشر سنين فاضربوه عليها (سنن ابی داود، جامع ترمذی)

۳. عن ابی هريرة قال: قال رسول ﷺ من اتاه الله مالا فلم يود زكوة مثل له ماله يوم القيامة شجاعا اقرع له زبيبتان يطوقه يوم القيامة ثم يأخذ بلهزمتيه (يعنی شدقيه) ثم يقول انا مالک وانا كنزک ثم تلا ولا يحسبن الذين يبخلون بما آتهم الله من فضله هو خير لهم بل هو شر لهم سيطوقون ما بخلوا به يوم القيامة..... الخ (بخاری)

۴. عن علی قال: قال رسول الله ﷺ من ملک زاد راحلته تبلغه الی بيت الله ولم يحج فلا عليه ان يموت يهوديا اونصرانيا وذلک لان الله تبارک وتعالی يقول ولله علی الناس حج البيت من استطاع اليه سبيلا (جامع ترمذی)

۵. صفات مومنین

آیات

۱. و عباد الرحمن الذين يمشون على الارض هونا و اذاخاطبهم الجاهلون قالوا سلما. (الفرقان: ۱)

۲. والذين يبيتون لربهم سجدا و قياما. (الفرقان: ۶۴)

۳. والذين يقولون ربنا اصرف عنا عذاب جهنم ان عذابها كان غراما. (الفرقان: ۶۵)

۴. انها ساءت مستقرا و مقاما. (الفرقان: ۶۶)

۵. والذين اذا انفقوا لم يسرفوا ولم يقتروا وكان بين ذالک قواما. (الفرقان: ۶۷)

۶. والذين لايدعون مع الله الها آخر ولايقتلون النفس التی حرم الله الا بالحق ولا يزنون ومن يفعل ذالک يلق اثاما. (الفرقان: ۶۸)

۷. يضعف له العذاب يوم القيمة و يخلد فيه مهانا. (الفرقان: ۶۹)

۸. الا من تاب و امن وعمل صالحا فأولئک يبدل الله سياتهم حسنت وكان الله غفورا رحيما. (الفرقان: ۷۰)

۹. ومن تاب وعمل صالحا فانه يتوب الى الله متابا. (الفرقان: ۷۱)

۱۰. والذين لا يشهدون الزور واذا مروا باللغو مروا كراما. (الفرقان: ۷۲)

۱۱. والذين اذا ذكروا بايت ربهم لم يخروا عليها صما و عميانا. (الفرقان: ۷۳)

۱۲. والذين يقولون ربنا هب لنا من ازواجنا و ذريتنا قرة أعين و اجعلنا للمتقين اماما. (الفرقان: ۷۴)

۱۳. اولئک يجزون الغرفة بما صبروا و يلقون فيها تحية وسلما. (الفرقان: ۷۵)

۱۴. خلدين فيها حسنت مستقرا و مقاما. (الفرقان: ۷۶)

۱۵. قل ما يعبؤا بكم ربی لو لا دعاؤكم فقد كذبتم فسوف يكون لزاما. (الفرقان: ۷۷)

۴. والذين هم لفروجهم حافظون. (المومنون: ۴)

۵. الا على ازواجهم اوما ملكت ايمانهم فانهم غير ملومين. (المومنون: ۵)

٦. والذين هم على صلوتهم يحافظون. (المومنون: ٦)

٧. اولئک هم الوارثون. (المومنون: ٧)

٨. الذين يرثون الفردوس. (المومنون: ٨)

٩. هم فيها خالدون. (المومنون: ٩)

احادیث

١. عن انس قال: قال رسول الله ﷺ والذی نفسی بیده لا یؤمن عبد حتی یحب لا خیه ما یحب لنفسه (متفق علیه)

٢. عن النعمان بن بشیرؓ قال: قال رسول الله ﷺ تری المؤمنین فی تراحمهم و توادهم وتعاطفهم کمثل الجسد اذا شتکی عضو تداعی له سائر الجسد بالسهر والحمی (متفق علیه)

٦. آدابِ معاشرت

١. وان طائفتان من المومنین اقتلوا فاصلحوا بینهما فان بغت احداهما علی الاخری فقاتلوا التی تبغی حتی تفیء الی امر الله فان فآئت فاصلحوا بینهما بالعدل واقسطوا ان الله یحب المقسطین. (الحجرات: ٩)

٢. انما المومنون اخوة فاصلحوا بین اخویکم واتقوا الله لعلکم ترحمون. (الحجرات: ١٠)

٣. یاایها الذین امنوا لایسخر قوم من قوم عسی ان یکونوا خیرا منهم ولانساء من نساء عسی ان یکن خیرا منهن ولا تلمزوا انفسکم ولاتنابزوا بالالقاب بئس الاسم الفسوق بعدالایمان ومن لم یتب فاولئک هم الظالمون. (الحجرات: ١١)

٤. یا ایها الذین امنوا اجتنبوا کثیرا من الظن ان بعض الظن اثم ولا تجسسوا ولایغتب بعضکم بعضا. ایحب احدکم ان یاکل لحم اخیه میتا فکرهتموه واتقوا الله ان الله توا ب رحیم (الحجرات: ١٢)

٥. یاایها الذین انا خلقناکم من ذکر وانثی وجعلناکم شعوبا وقبائل لتعارفوا ان اکرمکم عند الله اتقاکم ان الله علیم خبیر (الحجرات: ١٣)

احادیث

١. عن ابی هریرةؓ ان رسول الله ﷺ قال: ان المفلس من امتی من یاتی یوم القیامة بصلاة و صیام وزکوة، ویاتی قدشتم هذا، وقذف هذا، واکل مال هذا، وسفک دم هذا، و ضرب هذا، فیعطی هذا من حسناته ، و هذا من حسناته ، وهذا من حسناته، فان فنیت حسناته قبل ان یقضی ما علیه اخذ من خطایاهم فطرحت علیه ثم طرح فی النار

٧. دعوت واقامتِ دین

١. ومن اظلم ممن افتری علی الله الکذب و هو یدعی الی الاسلام والله لا یهدی القوم الظالمین. (الصف: ٧)

٢. یریدون لیطفئوا نور الله بافواههم، والله متم نوره ولو کره الکافرون. (الصف: ٨)

٣. هو الذی ارسل رسوله بالهدی ودین الحق لیظهره علی الدین کله ولو کره المشرکون. (الصف: ٩)

احادیث

١. عن ابی سعید ن الخدریؓ عن رسول الله ﷺ قال من رای منکم منکراً فلیغیره بیده فان لم یستطع فبلسانه فان لم یستطع فبقلبه. و ذالک أضعف الایمان (مسلم)

٢. عن عبدالله بن عمرؓ قال قال رسول الله ﷺ الا کلکم راع و کلکم مسؤل عن رعیته فالامام الذی علی الناس راع وهو مسؤل عن رعیته والرجل راع علی اهل بیته وهو مسؤل عن رعیته و المرأة راعیة علی بیت زوجها وولده وهی مسؤلة عنهم وعبدالرجل راع علی

۲. یاایهاالذین امنوا لا ترفعوا اصواتکم فوق صوت النبی ولا تجهروا له بالقول کجهر بعضکم لبعض ان تحبط اعمالکم و انتم لا تشعرون. (الحجرات: ۲)

۳. ان الذین یغضون اصواتهم عندرسول الله اولئک الذین امتحن الله قلوبهم للتقوی لهم مغفرة واجر عظیم. (الحجرات: ۳)

۴. ولوانهم صبروا حتی تخرج الیهم لکان خیرا لهم والله غفوررحیم. (الحجرات: ۴)

۵. ان الذین ینادونک من ورآء الحجرات اکثرهم لا یعقلون. (الحجرات: ۵)

۶. یاایهاالذین امنوا ان جاء کم فاسق بنبا فتبینوا ان تصیبوا قوما بجهالة فتصبحوا علی ما فعلتم نادمین. (الحجرات: ۶)

۷. واعلموا ان فیکم رسول الله لو یطیعکم فی کثیر من الامرلعنتم ولکن الله حبب الیکم الایمان وزینه فی قلوبکم و کره الیکم الکفر والفسوق والعصیان اولئک هم الراشدون. (الحجرات: ۷)

۸. فضلا من الله و نعمة و الله علیم حکیم. (الحجرات: ۸)

۹. النبی اولی بالمؤمنین من انفسهم وازواجه امهتهم و اولوالارحام بعضهم اولی ببعض فی کتاب الله من المؤمنین المهاجرین الا ان تفعلوا الی اولیاء کم معروفا، کان ذلک فی الکتاب مسطورا. (الاحزاب: ۶)

۱۰. ان الله وملائکته یصلون علی النبی یاایهاالذین امنوا صلوا علیه وسلموا تسلیما. (الاحزاب: ۵۶)

۱۱. ان الذین یوذون الله ورسوله لعنهم الله فی الدنیا والاخرة واعد لهم عذابا مهینا. (الاحزاب: ۵۷)

۱۲. لقد کان لکم فی رسول الله اسوة حسنة لمن کان یرجوا الله والیوم الآخر و ذکر الله کثیرا. (الاحزاب: ۲۱)

۱۳. ماکان محمد ابآ احد من رجالکم ولکن رسول الله وخاتم النبیین و کان الله بکل شیء علیما. (الاحزاب: ۴۰)

احادیث

عن العباس بن عبد المطلب قال: قال رسول الله ﷺ ذاق طعم الایمان من رضی بالله ربا وبالاسلام دینا وبمحمد رسولا

۳. آخرت

آیات

۱. یاایهاالذین امنوا اتقوا الله ولتنظرنفس ماقدمت لغد واتقوا الله ان الله خبیربما تعملون. (الحشر: ۱۸)

۲. ولاتکونوا کالذین نسوا الله فانسهم انفسهم اولئک هم الفاسقون (الحشر: ۱۹)

حدیث

عن ابن مسعود عن النبی ﷺ لاتزول قدما ابن آدم حتی یسئل عن خمس عن عمره فیما افناه وعن شبابه فیما ابلاه وعن ماله من این اکتسبه و فیم انفقه و ما ذا عمل فیم علم (جامع ترمزی)

۴. عبادات (نماز، زکوٰۃ، روزہ، حج، جہاد)

۱. قد افلح المومنون الذین هم فی صلاتهم خاشعون. (المومنون: ۱)

۲. والذین هم عن اللغومعرضون. (المومنون: ۳)

۳. والذین هم للزکوة فاعلون. (المومنون: ۴)

۴. یاایهاالذین امنوا هل ادلکم علی تجارة تنجیکم من عذاب الیم. (الصف: ۱۰)

۵. تؤمنون بالله ورسوله و تجاهدون فی سبیل الله باموالکم و انفسکم ذلکم خیر لکم ان کنتم تعلمون. (الصف ۱۱)

یغفرلکم ذنوبکم و یدخلکم جنات تجری من تحتها الانهر و مساکن طیبة فی جنت عدن ذلک الفوزا العظیم. (الصف: ۱۲)

مال سیدہ وھو مسؤل عنه الا فکلکم راع و کلکم مسؤل عن رعیته (متفق علیه)

۳. قال رسول الله ﷺ یجاء الرجل یوم القیامته فیلقی فی النار فتندلق اقتتابه فی النار فیطحن فیها کطحن الحمار برحاه فیجتمع اهل النار علیه فیقولون، ای فلان ماشانک، الیس کنت تأمر نا بالمعروف وتنهانا عن المنکر ؟ قال کنت امرکم ولا اتیه ونهاکم عن المنکر واتیه

احادیث

۱. عن عبدالله قال: قال رسول الله ﷺ طلب کسب الحلال فریضة بعدالفریضة (بیهقی: شعب الایمان)

۲. عن ابی سعید قال : قال رسول الله ﷺ التاجر الصدوق الامین مع النبیین والصدیقین والشهداء (جامع ترمذی)

باب دوم: مطالعہ سیرت (Seerah Study)

۱. مطالعہ سیرت کی اہمیت

۲. تزکیہ نفس اور تعمیر شخصیت کا نبوی منہاج

۳. تشکیل معاشرت اور اسوۂ حسنہ

۴. ہجرت مدینہ، مواخات اور میثاق مدینہ

۵. غزوات النبی، مقاصد و حکمت

۶. خطبہ حجۃ الوداع

باب سوم: مطالعہ تہذیب و تمدن (Study of Culture)

۱. تہذیب کا مفہوم، اسلامی تہذیب کی خصوصیات

۲. بنیادی انسانی حقوق

۳. تہذیب انسانی کے ارتقاء میں مسلمانوں کا کردار

۴. اسلام کا تصور علم

۵. طبیعی علوم، حیاتیاتی علوم اور معاشرتی علوم میں مسلمانوں کا کردار

۶. مکالمہ بین المذاہب

.....

پرچہ میں نمبروں کی تقسیم درج ذیل ہو گی

قرآن و حدیث موضوعاتی مطالعہ : ۶۰

مطالعہ سیرت : ۲۰

مطالعہ تہذیب و تمدن : ۲۰

Annexure-B

SS-2312 - Pakistan Studies

Course Outline for Pakistan Studies

ulsory Course of Two Credit Hours for Under-Graduate Studies and BA/BSc urse of 40 marks as compulsory course.

ectives: The objectives of this course are to acquaint the students with:

1. Two Nation Theory and Ideology of Pakistan
   a. Historical background of creation of Pakistan
   b. Two Nation Theory in its historical context, definition and interpretations
   c. Quaid-i-Azam and his political ideas.

2. Political Dynamics of Pakistan
   a. Constitutional development in Pakistan. (1947-79)
   b. Salient features of constitution of Pakistan 1973.
   c. Institutions of Pakistan: political parties, bureaucracy, army, judiciary and media.
   d. Problems of Pakistan as a Federal State.

3. Socio-Economic Issues of Pakistan.
   a. Environmental Problems.
   b. Social and demographic issues.

4. Diplomatic Dynamics of Pakistan.
   a. Determinants and objectives of Pakistan's foreign policy.
   b. Pakistan's relations with its neighbouring countries.
   c. Pakistan and the Muslim World (A comprehensive review of foreign policy of Pakistan)

ommended Books

1. Javed Ahmad Sheikh, *Pakistan's Political, Economic, and Diplomatic Dynamics*, Lahore: Kitabistan Paper Products.
2. Other relevant readings for the individual subjects shall be recommended by the teacher during the course.

Annexure-C

SS-2410 - Principles of Psychology

Course Objectives

- To Ensure An Effective Orientation Of Students Towards The Discipline Of Psychology So That They May Be Come To Appreciate The Diversity Of The Subject And Its Pragmatic Significance.
- To Make Students Familiar With The Essential Features Of Research Enterprise In Psychology.
- To Include The Sense Of Personal Relevance Of Psychology As A Subject With The Potential Of Gaining Better Insight Into One's Own Self.

Introduction to Psychology

- Nature and Application Of Psychology With Special Reference To Pakistan.
- Research Enterprise In Psychology
- Goals Of Scientific Enterprise
- Experimental Research
- Descriptive/Corelational Research

i) Naturalistic Observation ii) Case History Method iii) Survey Method

- Statistics And Research

i) Descriptive ii) Inferential

Biological Basis of Behavior

- Communication In The Nervous System
- Organization Of The Nervous System
- The Brain And The Behavior

Sensation and Perception

- Psychophysics: Basic Concepts And Issues
- An Overview Of Sensory Perception (Vision, Hearing)
- Sleep and Dreams, Hypnosis and Meditation and drug use

Motivation and Emotions

- Definitions
- Types of Motivation

- Maslow's Theory
- James Lange Theory
- Cannon Bard Theory
- Schechter Singer Theory

Learning

- Definition Of Learning
- Types Of Learning

i. Classical Conditioning,
ii. Operant Conditioning
iii. Observational Learning

Intelligence

i. What is intelligence, Artificial Intelligence
ii. Variation in intellectual abilities,
iii. Group differences in intelligence: Genetic and Environmental determinants

Human Memory

- Encoding: Getting Information Into Memory
- Storage: Maintaining Information Into Memory
- Retrieval: Getting Information Out Of Memory
- Forgetting: When Memory Lapses

Language and Thinking

- Problem Solving and reasoning: In Search Of Solutions
- Decision Making: Choices And Chances
- Language

Personality: Theory, Research and Assessment Perspective

- Biological Perspective
- Cognitive Perspective
- Psychodynamic Perspective
- Behavioral Perspective
- Humanistic approach
- Personality assessment

Health Psychology

- Coping, Stress and Well- Being

- Stress and Coping
- Psychological aspects of Well-Being
- Promoting Health and Wellness

Social Psychology

- Attribution Theory
- Obedience And Power
- Group Dynamics
- Attitudes

Recommended Books:

1- Feldmen, R. S. (2012). *Understanding Psychology* (10th ed.). University of Massachusetts Amherst, ISBN: 0073382795

2- Weiten, W. (2001). *Psychology: Themes and Variations.* (5th ed.). New York: Wadsworth.