

Revised  
Curriculum  
of  
BS Information Technology  
for  
Main Campus, Sub Campuses,  
and  
Affiliated Colleges



Department of Computer Science & Information Technology

University of Sargodha

(Applicable from Fall 2013)

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• 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). ....	41
• AQA Functional English Student Book: Pass Level 2 by Mr David Stone, Heinemann; 1st Edition (28 Jun 2010). ISBN-10: 0435151401.....	41
• English Composition and Grammar: Complete Course by John E. Warriner, Harcourt Brace Jovanovich; Complete Course Benchmark Edition (January 1988). ISBN-10: 0153117362.....	41
• Companion to English: Vocabulary (Learners Companion) by George Davidson, Prim-Ed Publishing (March 1, 2003). ISBN-10: 9814070904.....	41
• Word Power Made Easy by Norman and Lewis, Goyal Publishers (September 1, 2009). ISBN-10: 8183071007.....	41
• 1000 Most Important Words by Norman W. Schur, Ballantine Books (July 12, 1982).	

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## **Guidelines for Affiliated Colleges**

- BSIT 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 approved 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 approved by the BOS. 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.

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## The Discipline of Information Technology

In early days, 'Computer Science' was used as a common term for computing. With the passage of time, the nature of basic principles, methods, techniques and concepts evolved. Even some new concepts refuted the old ones. Before 1990s, computing was limited to three disciplines – Computer Science (CS), Computer Engineering (CE), and Information Systems (ISs). By 1990s, the global community realized that the field of computing had grown in many dimensions. Different academic institutions started offering different degree programs in Software Engineering (SE).

The inventions of personal computers revolutionized the conventional concepts of calculation and changed the way data was stored, retrieved and controlled. Computers became essential tools at every level and networked computer systems became the information backbone of organizations (Kotkin, 2000). It also expedited the pace of inventions (Thomson, 2007) resulting many innovations in communication and computation technologies which brought a paradigm shift in the business world - from data processing to information processing; converting industrial society into an information society (Cohen, 2009). While this paradigm shift improved productivity, it also brought new challenges regarding the development, operation, maintenance, and up-gradation of organizational information management infrastructure (Samuelson, 1995).

By the end of 1990s, the academia realized that the existing computing degree programs were not producing graduates who had the right mix of knowledge and skills to meet organizational challenges (Lunt, et. al., 2005). Consequently, universities developed new degree programs in Information Technology (IT) to fill this crucial void (Denning, 2001); Hence IT was introduced as a new family member of computing disciplines (Lunt, et. al., 2005).

According to Curricula 2005: The Overview Report: "Information technology is a label that has two meanings. In the broadest sense, the term information technology is often used to refer to all of computing. In academia, it refers to undergraduate degree programs that prepare students to meet the computer technology needs of business, government, healthcare, schools, and other kinds of organizations". Curriculum Guidelines for Undergraduate Degree Programs in Information Technology (2008) explains that "Information Technology (IT) in its broadest sense encompasses all aspects of computing technology. IT, as an academic discipline, is concerned with issues related to advocating for users and meeting their needs within an

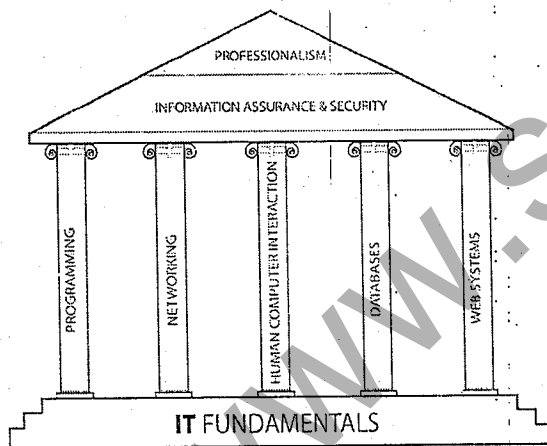


Figure 3-2. The Information Technology Discipline

organizational and societal context through the selection, creation, application, integration and administration of computing technologies." Figure 1<sup>1</sup>, depicts the key pillars of academic discipline of Information Technology

<sup>1</sup>Curriculum Guidelines for Undergraduate Degree Programs in Information Technology (2008)

Information Technology as an academic discipline, as defined by The Information Technology Association of America (ITAA), is “the study, design, development, application, implementation, support or management of computer-based information systems, particularly software applications and computer hardware”. It deals with the use of electronic computers and computer software to securely convert, store, protect, process, transmit, input, output, and retrieve information. [Wikipedia]

## **Vision of Information Technology Education**

As defined in cc2008 “Information Technology is very much an integrative discipline; it pulls together the IT pillars of databases, human-computer interaction, networking, programming, and web systems and uses a solid background in each of them to enable graduates to solve all types of computing and informational problems, regardless of their origin. As a discipline, IT emphasizes the pervasive themes of user centeredness and advocacy, information assurance and security, and the management of complexity through abstraction and modeling. best practices, patterns, standards, and the use of appropriate tools.” In the light of this explanation, the curriculum committee formalized the Vision Statement for IT education in Pakistan as follows:

The IT education in Pakistan will focus on imparting the knowledge and training which enable students

- to understand and contribute to the scientific, mathematical and theoretical foundations on which information technologies are built;
- to use and apply current technical concepts, techniques, skills, tools and practices to analyze the local and global impact of IT on individuals, organizations, and society and to identify their computing needs, and select, design, create, implement, administer and evaluate a computer-based system, process, component, or program to meet the desired needs and integrate them into the user environment;
- to develop students’ interpersonal and organizational skills to communicate effectively with a range of audience, create operative project plans and work in a collaborative environment;
- to strengthen students’ understanding of professional, ethical, legal and social issues and responsibilities;
- to develop students’ capacity for innovation and passion for lifelong learning.

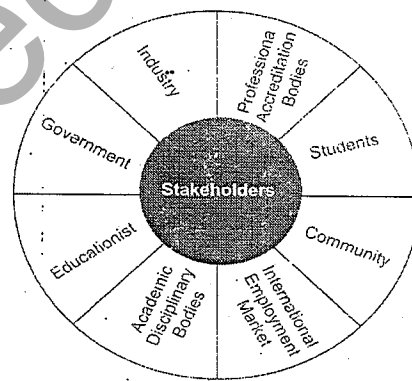
IT curriculum thus aims to achieve the targets set in the vision statement. It should strive to meet the professional demands of the industry and academia both in terms of immediate needs and the capacity for longer term development to avail the opportunities and face the challenges of the modern world. The committee is of the view that the curriculum must focus on building a solid foundation in the early stages of learning. Thus, Information Technology concepts should be taken up as early as the start of 1<sup>st</sup> year. These should gradually be strengthened through developing the core competencies and desired skill-sets during the second, third and fourth years. The students must also be provided opportunities to bring together the knowledge gained in a wide variety of courses to solve realistic problems in a team-based environment through lab sessions, practical assignments, course projects and a capstone design project.

## Information Technology Programs' Rational

The digital revolution not only reshaped the way scientists conduct their research but also expedite the pace of inventions. Consequently, the latest advancements in technologies for communication, computation, and delivery of information brought a paradigm shift in the business world - from data processing to information processing - converting computer technology into information technology (IT) and industrial society into an "information society". While this paradigm shift improves productivity, it also created new work place challenges regarding the development, operation, maintenance, and up-gradation of organizational IT infrastructure. Inventions like the Internet, the World Wide Web, email, bulletin board systems, virtual communities, E-business and other online technologies forced organizations to find IT based solutions to all kinds of business challenges. For this, organizations need appropriate systems that work properly and professionals who make these systems secured, upgraded, and maintained. In parallel, employees require support from these professionals to make technology effective for enhancing organizational productivity. This has created a huge demand of IT professionals both locally and globally. Meeting this demand is the key rationale behind the IT programs. In this regard, the IT programs offer a curriculum structure that can produce graduates who can meet above discussed challenges of the 21st century's knowledge driven complex work places. The curriculum structure will create, expand, disseminate and teach the information technology body of knowledge through academics, applications and research which positively impact society (locally, nationally, and internationally). It will also provide an integration of all components that allow accessing all of the new knowledge and technologies for meeting the above discussed challenges.

## Underlying Principles of Information Technology Programs

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 institu-

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tions.

- 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. To achieve the curricula have 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 than just having programming skills.
- vi. Values: Moral, ethical and professional practices.

To strengthen the curriculum further, specialization tracks have also been integrated within the curriculum's BOK. 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.

# Curriculum for BS Information Technology Program

## Details of BS Information Technology

### Program's Aims & Objectives

The aim of the BS (IT) program is to produce entrepreneurs of great character, competence, vision and drive equip 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 information technology domain or proceed to further or higher education or training. One of the key objectives of the program is to equip students with skills and knowledge that enable them to take on appropriate professional positions in IT and grow into leading roles. The goals of the program are to produce, in coordination with organizational management, IT graduates who have ability to:

- Apply knowledge of computing and mathematics appropriate to the discipline.
- Analyze a problem, and identify and define the computing requirements appropriate to its solution.
- Design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs.
- Function effectively on teams to accomplish a common goal.
- Understand the professional, ethical, legal, security and social issues and responsibilities.
- Communicate effectively with a range of audiences.
- Analyze the local and global impact of computing on individuals, organizations, and society.
- Recognize the need for and an ability to engage in continuing professional development.
- Use the current techniques, skills, and tools necessary for computing practice.
- Use and apply the latest technical concepts and practices in the core information technologies.
- Identify and analyze user needs and take them into account in the selection, creation, evaluation and administration of computer-based systems.
- Integrate IT-based solutions into the user environment.
- Understand the best practices and standards and their application.
- Assist in the creation of an effective project plan.

### Program's Outcome

BSIT program will produce entrepreneurs of great character, competence, vision and drive equip 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 information technology domain or proceed to further or higher education or training.

## Program's Structure

The structure of BSIT program is very dynamic and 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:

### Specialization Tracks

Students can opt one of the following specialization track:

1. Regular Track
2. Technology Management
3. Multimedia Systems & Game Development
4. Web Engineering
5. Database Management Systems
6. Software Engineering

### Degree Requirement

Minimum credit hours shall be 138 for BS Information Technology program including elective courses & a capstone project.

### Duration

The program shall comprise Eight (8) Semesters/Terms spread over Four (4) calendar years with two Semesters/Terms a year as per rules of the University.

### Eligibility Criteria

Minimum 2<sup>nd</sup> division or equivalent in Intermediate or equivalent qualification.

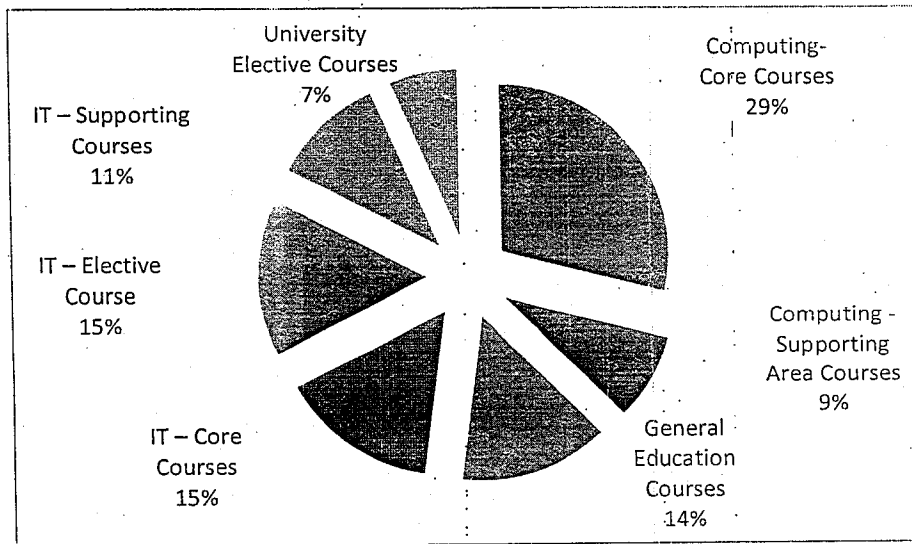
### Assessment & Evaluation

University's semester and examination rules & regulations shall be followed for assessment & evaluation.

### Distribution of Courses

Followings are the distribution of total credit hours:

Distribution of Courses		
Major Areas	Credit Hours	%
Computing- Core Courses	40	29%
Computing - Supporting Area Courses	12	9%
General Education Courses	20	14%
IT – Core Courses	21	15%
IT – Elective Course	21	15%
IT – Supporting Courses	15	11%
University Elective Courses	9	7%
<b>Total</b>	<b>138</b>	<b>100%</b>



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 Structures and Algorithms	3 (3+0)
5	CMP-2210	-	Digital Logic and 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)

\* Labs are preferred in relative courses. However, implementation details are left upon the Institutes.

Computing Supporting Area Elective Courses - 12 Credit Hours				
#	Code	Pre-Req	Course Title	Cr. Hrs.
12	MATH-2213	-	Calculus and Analytical Geometry	3 (3+0)
13	MATH-2110	-	Probability and Statistics	3 (3+0)
14	MATH-3215	-	Linear Algebra	3 (3+0)
15	PHY-2210	-	Basic Electronics	3 (3+0)

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

IT — Core Courses (21 Credits Hours) Required IT Core Courses				
#	Code	Pre-req	Course Name	Cr. Hrs.
23	IT-3548	CMP-2122	Web Systems and Technologies	3 (3+0)
24	IT-3743	-	Multimedia Systems and Design	3 (3+0)
25	IT-4511	CMP-2540	Systems and Network Administration	3 (3+0)
26	IT-4541	IT-4511	Data & Network Security	3 (3+0)
27	IT-4544	CMP-3621	Cloud Computing	3 (3+0)
28	IT-4344	CMP-3310	System Integration and Architecture	3 (3+0)
29	IT-3431	-	Technology Management	3 (3+0)

IT — Supporting Courses (15 Credits Hours) Required Supporting Courses				
#	Code	Pre-req	Course Name	Credit hours
30	IT-4349	CMP-3310	IT Project Management	3 (3+0)
31	IT-3513	CMP-2540	Internet Architecture & Protocols	3 (3+0)
32	SE-3311	CMP-2123	Object Oriented Analysis and Design	3 (3+0)
33	IT-3441	CMP-3450	Database Administration & Management	3 (3+0)
34	IT-2410	-	Information Systems	3 (3+0)

University Electives Courses (9 Credits Hours)				
#	Code	Pre-req	Course Name	Cr. Hrs.
35	MNG-2210	-	Financial Accounting	3 (3+0)
36	MNG-2215	-	Human Resource Management	3 (3+0)
37	MNG-2212	-	Principles of Management	3 (3+0)
38	SS-2511	-	Principles of Philosophy	3 (3+0)
39	SS-2410	-	Principles of Psychology	3 (3+0)
40	SS-2XXX	-	Foreign/Regional Language (French, German, Sindhi, Punjabi etc.)	3 (3+0)
41	MNG-3262	-	Entrepreneurship	3 (3+0)

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## Information Technology Elective Courses

Regular Track Elective Courses (21 Credit Hours - Any 7 Courses)				
42	IT-4461	CMP-3450	Enterprise Resource Planning Systems	3(3+0)
43	IT-4543	IT-3541	Information Technology Infrastructure	3(3+0)
44	IT-4547	CMP-2123	Mobile Application Development	3(3+0)
45	IT-4744	IT-3548	Enterprise Application Development	3(3+0)
46	IT-4746	CMP-3310	E-Commerce Applications Development	3(3+0)
47	IT-4741	CMP-3112	Computer Game Development	3(3+0)
48	IT-3541	CMP-2540	Network Design and Management	3(3+0)
49	IT-3810	CMP-2111	Artificial Intelligence	3 (3+0)

Networking Specialization Elective Courses(21 Credit Hours - Any 7 Courses)				
50	IT-4462	CMP-3450	Information Systems Auditing and Assurance	3(3+0)
51	IT-4461	CMP-3450	Enterprise Resource Planning Systems	3(3+0)
52	IT-4569	IT-3513	Routing & Switching	3(3+0)
53	IT-4547	CMP-2540	Introduction to Broadband Communication Systems	3(3+0)
54	IT-4543	IT-3541	Information Technology Infrastructure	3(3+0)
55	IT-3542	CMP-2122	Network Programming	3(3+0)
56	IT-3541	CMP-2540	Network Design and Management	3(3+0)

Web Engineering Specialization Elective Courses(21 Credit Hours - Any 7 Courses)				
57	IT-4744	IT-3548	Enterprise Application Development	3(3+0)
58	IT-4746	CMP-3310	E-Commerce Applications Development	3(3+0)
59	IT-4741	CMP-3112	Computer Game Development	3(3+0)
60	IT-4547	CMP-2123	Mobile Application Development	3(3+0)
61	IT-4513	IT-3548	Web Engineering	3(3+0)
62	IT-4747		Semantic Web Techniques	3(3+0)
63	IT-4545	IT-3548	Mobile Computing	3(3+0)

Database Management Systems Specialization Elective Courses(21 Credit Hours - Any 7 Courses)				
64	IT-4441	CMP-3450	Data Warehousing	3(3+0)
65	IT-4442	CMP-3450	Data Mining	3(3+0)
66	IT-4443	IT-4441	Business Intelligence and Analytics	3(3+0)

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67	IT-4444	IT-3450	Advance Database Management	3(3+0)
68	IT-4461	CMP-3450	Enterprise Resource Planning Systems	3(3+0)
69	IT-4462	CMP-3450	Information Systems Auditing and Assurance	3(3+0)
70	IT-4365	-	Business Process Management	3(3+0)
71	IT-4861	-	Knowledge Management	3(3+0)

<b>Software Engineering Specialization Elective Courses (21 Credit Hours - Any 7 Courses)</b>				
72	SE-3342	CMP-3310	Software Requirement Engineering	3(3+0)
73	SE-4343	SE-3342	Software Design and Architecture	3(3+0)
74	SE-4341	CMP-3310	Software Quality Engineering	3(3+0)
75	SE-4342	CMP-3310	Software Engineering Economics	3(3+0)
76	SE-4344	CMP-3310	Software CASE Tools & Applications	3(3+0)
77	SE-4345	CMP-3310	Design Patterns	3(3+0)
78	SE-3344	CMP-2122	Software Construction	3(3+0)

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## 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	Explanation
1	<b>UNDER-GRADUATE</b>	Non-Credited Courses
2		Foundation + Core Level 1 Courses
3		Core Level 2 + Specialization Level 1
4		Specialization Level 2
5	<b>GRADUATE (MS/M.PHIL)</b>	Core + Specialization Level 1
6		Specialization Level 2
7	<b>PHD</b>	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
PHY	Physics

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

## Proposed Scheme of Studies for BSIT Program

(For Regular Track)

Semester 1 19 Cr. Hrs.	Semester 2 19 Cr. Hrs.	Semester 3 18 Cr. Hrs.	Semester 4 18 Cr. Hrs.	Semester 5 19 Cr. Hrs.	Semester 6 18 Cr. Hrs.	Semester 7 18 Cr. Hrs.	Semester 8 12 Cr. Hrs.
CMP-2122 4(3+1) Programming Fundamentals* <i>22</i>	CMP-2123 4(3+1) Object Oriented Programming* <i>21</i>	CMP-3112 3(3+0) Data Structures and Algorithms* <i>24</i>	SS-4910 3(3+0) Professional Practices <i>47</i>	CMP-3711 3(3+0) Human Computer Interaction <i>33</i>	IT-3548 3(3+0) Web Systems and Technologies <i>55</i>	CMP-4970 3(0+3) Capstone Project Part I <i>34</i>	CMP-4970 3(0+3) Capstone Project Part II* <i>60</i>
PHY-2210 3(3+0) Basic Electronics** <i>38</i>	CMP-2210 3(3+0) Digital Logic Design* <i>25</i>	CMP-2540 3(3+0) Computer Communication and Networks* <i>37</i>	IT-3513 3(3+0) Internet Architecture & Protocols <i>56</i>	CMP-3621 4(3+1) Operating Systems* <i>22</i>	IT-4511 3(3+0) Systems and Network Administration <i>57</i>	IT-4542 3(3+0) Data & Network Security <i>58</i>	IT-4541 3(3+0) Cloud Computing <i>69</i>
MATH-2213 3(3+0) Calculus and Analytical Geometry** <i>36</i>	CMP-2111 3(3+0) Discrete Structures* <i>23</i>	MNG-2210 3(3+0) Financial Accounting <i>48</i>	CMP-3310 3(3+0) Software Engineering <i>30</i>	SE-3311 3(3+0) OO Analysis & Design <i>68</i>	IT-4745 3(3+0) Enterprise Application Development <i>78</i>	IT-3541 3(3+0) Network Design and Management <i>75</i>	IT-4461 3(3+0) Enterprise Resource Planning Systems**** <i>72</i>
IT-2021 4(3+1) Intro to ICT <i>45</i>	MNG-2212 3(3+0) Principles of Management <i>50</i>	IT-2410 3(3+0) Information Systems <i>71</i>	CMP-3450 4(3+1) Database Systems* <i>28</i>	IT-3441 3(3+0) DB Admin. & Manag. <i>69</i>	IT-4541 3(3+0) IT Infrastructure <i>73</i>	IT-4548/47 3(3+0) Mobile Application Development <i>77</i>	IT-4741 3(3+0) Computer Game Development**** <i>80</i>
ENG-2411 3(3+0) Functional English*** <i>40</i>	ENG-2412 3(3+0) Communication Skills*** <i>61</i>	ENG-2413 3(3+0) Technical and Report Writing <i>46</i>	MNG-3262 3(3+0) Entrepreneurship <i>54</i>	IT-3743 3(3+0) Multimedia Systems and Design <i>13</i>	IT-3544 3(3+0) System Integration and Architecture <i>61</i>	IT-4746 3(3+0) E-Commerce Applications Development**** <i>79</i>	
SS-2311 2+0 Islamic Studies/Ethics*** <i>45</i>	MATH-2110 3(3+0) Probability and Statistics** <i>36</i>	MATH-3215 3(3+0) Linear Algebra** <i>37</i>	SS-2312 2+0 Pakistan Studies*** <i>45</i>	IT-3431 3(3+0) Technology Management <i>63</i>	IT-4349 3(3+0) IT Project Management <i>64</i>		

- \* Computing Core Courses
- \*\* Computing Supporting Area Elective Courses
- \*\*\* General Education Courses
- ^ University Elective Courses
- ^^ Information Technology – Core Courses
- ^^^ Information Technology Supporting Courses
- \*\*\*\* Specialization Elective Courses

## Course Contents for BS Computer Science

### Contents of Computing Core Courses

#### 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]

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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; 7<sup>th</sup> 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

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, Up-casting 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), Read-

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- ing 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, 7<sup>th</sup> Edition, 2011, ISBN: 978-0-470-40414-0

**Reference Material:**

- Java™ Programming by Joyce Farrell, 6<sup>th</sup> Edition, Cengage Learning, 2012, ISBN-13:978-1-111-52944-4
- Java™ How to Program by Paul Deitel and Harvey Deitel, Pearson, 9<sup>th</sup> 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****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.

**Course Outline:**

1. Logic: Propositional Equivalences, Predicates and Quantifiers, Nested Quantifiers,

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- 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. [TB: Ch. 11]

**Textbook(s):**

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

**Reference Material:**

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

**Course Title: Data Structures 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

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*3rd Term*

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, The Josephus 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, 4<sup>th</sup> Edition (October 7, 2009). ISBN-10: 0321541405
- Schaum's Outline of Data Structures with Java by John Hubbard, McGraw-Hill; 2<sup>nd</sup> Edition (May 26, 2009). ASIN: B0035X1BQ6

#### Reference Book(s):

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

**Course Title: Digital Logic and Design**

**Course Code: CMP-2210**

**Course Structure: Lectures: 3/Labs: 0**

**Credit Hours: 3**

**Prerequisites: None**

**Course Objectives:**

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*2nd Semester*

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, QuineMcCluskey 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.

### Course Outline:

1. Number Systems, Operations, and Codes: Decimal Numbers, Binary Numbers, Decimal-to-Binary Conversion, Binary Arithmetic, 1'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 Karnaugh 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 Converters: 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]

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**Textbook(s):**

- Digital Fundamentals by Thomas L. Floyd, Prentice Hall; 9<sup>th</sup> 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; 1<sup>st</sup> Edition (July 28, 2006). ISBN-10: 0470044373
- Fundamentals of Logic Design by Jr. Charles H. Roth and Larry L Kinney, CL Engineering; 6<sup>th</sup> Edition (March 13, 2009). ISBN-10: 0495471690

**Course Title: Operating Systems****Course Code: CMP-3621****Course Structure: Lectures: 3/ Labs: 1****Credit Hours: 4****Pre-requisites: None***5th Semester***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 course. 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, Interpro-

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- cess Communication, Communication in Client- Server Systems. Threads: Multi-threading 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; 8<sup>th</sup> Edition (July 5, 2008). ISBN-10: 0470128720

**Reference Material:**

- Applied Operating Systems Concepts by Silberschatz A., Peterson, J.L., & Galvin P.C. Wiley; 8<sup>th</sup> Edition (2011). ISBN-10: 1118112733
- Modern Operating Systems by Tanenmaum A.S., Prentice Hall; 3<sup>rd</sup> 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***4<sup>th</sup> Semester***Course Objectives:**

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:

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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. Client-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. Client-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 Hooper, Mary Prescott, Prentice Hall; 11<sup>th</sup> Edition (July 26, 2012). ISBN-10: 0132662256
2. Database Systems A Practical Approach to Design, Implementation, and Management, 4<sup>th</sup> Edition, Thomas Connolly, Carolyn Begg, Addison Wesley, 2005.
3. Introduction to Oracle: SQL and PL/SQL ISBN-10: 0131453203

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**Reference Material:**

- Database Design and Relational Theory: Normal Forms and All That Jazz by C. J. Date, O'Reilly Media; 1<sup>st</sup> Edition (April 24, 2012). ISBN-10: 1449328016
- Fundamentals of Database Systems by R. Elmasri and S. Navathe. 6<sup>th</sup> Edition, Addison-Wesley (2010). ISBN-10: 0136086209
- Database System Concepts by Abraham Silberschatz, Henry F. Korth and S. Sudarshan. McGraw-Hill; 6<sup>th</sup> Edition (2010). ASIN: B004Y3YXK2
- Database Systems: a Practical Approach to Design, Implementation and Management by T.Connolly and C.Begg, Addison-Wesley; 5<sup>th</sup> Edition (2009). ISBN-10: 0321523067
- Modern Database Management System by Fred, Jeffery A. Hoffer and Fred McFadden; Prentice Hall; 7<sup>th</sup> 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***4th Semester***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

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- 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, 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; 7<sup>th</sup> Edition (2009). ISBN-10: 0073375977
- Systems Analysis and Design by Gary B. Shelly, Thomas J. Cashman and Harry J. Rosenblatt, Course Technology; 7<sup>th</sup> Edition (2007). ISBN-10: 1423912225

**Reference Material:**

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

**Course Title: Computer Communication and Networks****Course Code: CMP-2540****Course Structure: Lectures: 3/ Labs: 0****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

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*3rd Semester*



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 802.11 Physical Layer, IEEE 802.11 Security Considerations. [TB1: Ch. 17]

**Textbook(s):**

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

**Reference Material:**

- Data Communications and Networking by Behrouz Forouzan, 4<sup>th</sup> Edition (2007). ISBN 978-007-125442-7
- Computer Networks by Andrew S. Tanenbaum and David J. Wetherall, Prentice Hall; 5<sup>th</sup> Edition (October 7, 2010). ISBN-10: 0132126958
- Computer Networks and Internets by Douglas E. Comer, Prentice Hall; 5<sup>th</sup> Edition (April 28, 2008). ISBN-10: 0136066984

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**Course Title: Human Computer Interaction****Course Code: CMP-3711****Course Structure: Lectures: 3/Labs: 0****Credit Hours: 3****Prerequisites: None***5th Semester***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; 3<sup>rd</sup> 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; 1<sup>st</sup> Edition (April 30, 1994). ISBN-10: 0201627698.
- Human-Computer Interaction Handbook: Fundamentals, Evolving Technologies, and Emerging Applications by Julie A. Jacko, CRC Press; 3<sup>rd</sup> Edition (May 4, 2012). ISBN-10: 1439829438
- Interaction Design: Beyond Human - Computer Interaction by Yvonne Rogers, Helen Sharp, and Jenny Preece, Wiley; 3<sup>rd</sup> 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; 1<sup>st</sup> Edition (June 3, 2010). ISBN-10: 012375030X

**Course Title: Capstone Project****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 templates are available with the Department.

**Contents of Computing Supporting Area Elective Courses****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.

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**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 Trigonometric 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; 10<sup>th</sup> Edition (1995) ISBN-10: 0201531747

**Reference Material:**

- Calculus and Analytical Geometry by Swokowski, Olinick and Pence, 6<sup>th</sup> Edition, (1994), Brooks/Cole Publishers.

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- Calculus by Howard Anton, Irl C. Bivens, Stephen Davis, Wiley; 10<sup>th</sup> Edition (2012), ISBN-10: 0470647728
- Calculus with Analytic Geometry: Student Solution Manual by Howard Anton, Wiley; 5<sup>th</sup> 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****Course Objectives:**

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

*2nd Semester***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 Theo-

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rem. Sampling Distribution of  $S^2$ , 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; 9<sup>th</sup> Edition (January 6, 2011). ISBN-10: 0321629116

**Reference Material:**

- Probability and Statistics for Engineers and Scientists by Anthony J. Hayter, Duxbury Press; 3<sup>rd</sup> Edition (February 3, 2006), ISBN-10: 0495107573
- Schaum's Outline of Probability and Statistics, by John Schiller, R. AluSrinivasan and Murray Spiegel, McGraw-Hill; 3<sup>rd</sup> 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**

**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

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*3rd Semester*

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; 4<sup>th</sup> Edition (February 10, 2009). ISBN-10: 0980232716

**Reference Material:**

- Elementary Linear Algebra with Applications by Bernard Kolman, David Hill, 9<sup>th</sup> 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, 4<sup>th</sup> Edition, Brooks/Cole, 2005
- Elementary Linear Algebra: Applications Version by Howard Anton, Chris Rorres, 9<sup>th</sup> Edition, Wiley, 2005.
- Linear Algebra and Its Applications by David C. Lay, 2<sup>nd</sup> Edition, Addison-Wesley, 2000.
- Linear Algebra by Harold M. Edwards, Birkhäuser; 1<sup>st</sup> Edition (2004). ISBN-10: 0817643702
- Linear Algebra: A Modern Introduction by David Poole by Brooks Cole; 3<sup>rd</sup> 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**

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*1st Semester*

**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. Intro to 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. Fibre Optics. Structure of Optical Fibres, Classification of Optical Fibres; Fibre Characteristics, Choice of Wavelength, Optical Fibre cable, Application of Fibre Optic Communication. [Ch 38]



**Textbook(s):**

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

**Reference Material:**

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

## **Contents of General Education Courses**

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

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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, 4<sup>th</sup> 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**

**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:**

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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 Listening, 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.

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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 Remember, 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; 1<sup>st</sup> 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; 4<sup>th</sup> 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**

**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,

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*3rd Semster*

- 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, 4<sup>th</sup> Edition (2007) . ISBN10: 0-20556-252-3

**Reference Material:**

- Technical English: Writing, Reading, and Speaking by Pickett and Laster. 8<sup>th</sup> Edition
- The Technical Writer's Companion by Alred, Gerald, Charles T. Brusaw and Walter E. Oliu, 3<sup>rd</sup> 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

**Course Title: Introduction to Information & Communication Technologies****Course Code: ICT-2021**

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**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]

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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):**

- Discovering Computers 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 by by 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,

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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; 3<sup>rd</sup> 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; 3<sup>rd</sup> 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; 1<sup>st</sup> Edition (2011). ISBN-10: 0470597178
- Software Engineering Best Practices: Lessons from Successful Projects in the Top Companies by Capers Jones, McGraw-Hill Osborne Media; 1<sup>st</sup> Edition (2009). ISBN-10: 007162161X

## Contents of University Elective Courses

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**Course Title: Financial Accounting**

**Course Code: MNG-2210**

**Course Structure: Lectures: 3/ Labs: 0**

**Credit Hours: 3**

**Prerequisites: None**

**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

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*3<sup>rd</sup> Semester*

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 Dishonoured Cheques.
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, Personal accounts, Partners Loan Accounts.

**Textbook(s):**

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

**Reference Material:**

- Fundamental Accounting Principles with Connect Plus by John Wild, Ken Shaw, and Barbara Chiappetta, McGraw-Hill/Irwin; 20<sup>th</sup> Edition (December 27, 2010). ISBN-10: 0077505980
- Principles of Managerial Finance by Lawrence J. Gitman and Chad J. Zutter, Prentice Hall; 13<sup>th</sup> Edition (2011). ISBN-10: 0136119468
- Accounting Principles by Jack L. Smith, Robert M. Keith and William L. Stephens, McGraw-Hill Companies, 3<sup>rd</sup> Edition (1993). ISBN-10: 0070430748

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- 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 Title: Principles of Management**

**Course Code: MNG-2212**

**Course Structure: Lectures: 3 / Labs: 0**

**Credit Hours: 3**

**Prerequisites: None**

**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 is 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]

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

**Reference Material:**

- Principles of Management by Charles W. L. Hill and Steven McShane, McGraw-Hill/Irwin; 1<sup>st</sup> 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; 10<sup>th</sup> Edition (January 27, 2011). ISBN-10: 0538479531
- Fundamentals of Management by Stephen P. Robbins, David A. DeCenzo and Mary Coulter, Prentice Hall; 7<sup>th</sup> Edition (January 13, 2010). ISBN-10: 0136109829

**Course Title: Human Resources 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

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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; 11<sup>th</sup> 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. Fottler and R. Bruce McAfee, South-Western Cengage Learning; 7th Edition (September 29, 2010). ISBN-10: 0538468076

**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:**

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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, 1<sup>st</sup> 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; 11<sup>th</sup> 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: B005NIRTUW
- Introduction to Philosophy by William James Earle, McGraw-Hill; 1 Edition (October 1, 1991). ISBN-10: 0070187835

**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: 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

**Course Name: Entrepreneurship****Course Code: MNG-3262****Course Structure: Lectures: 3/ Labs: 0****Credit Hours: 3****Pre-requisite: None***4th Semester***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. 14]

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**Textbook(s):**

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

**Reference Material:**

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

## **Contents of Information Technology Core Courses.**

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**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.

**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 Programming: Programming 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: Programming 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 Programming: Programming in PHP, [Ch. 3, 4,5,6]
- 7 Introduction MySQL, MySQL Functions, Accessing MySQL via phpMyAdmin,
- 8 Cookies, Sessions, and Authentication [Ch. 12]

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- 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; 1<sup>st</sup> 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; 2<sup>nd</sup> Edition (May 5, 2009). ISBN-10: 047051860X

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

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## 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]

**Text book(s):**

- Multimedia Making It Work Eighth Edition by Tay Vaughan, McGraw-Hill Osborne Media; 8 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. 2<sup>nd</sup> Edition, Wiley 2004, ISBN: 0-470-85890-7
- The Technology of Video and Audio Streaming by David Austerberry, Focal Press; 2<sup>nd</sup> Edition (2004). ISBN-10: 0240805801
- Multimedia Security: WaTermarking, Steganography, and Forensics by Frank Y. Shih, CRC Press; 1<sup>st</sup> 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; 1<sup>st</sup> Edition (2012). ISBN-10: 0240813944

**Course Title: Systems and Network Administration****Course Code: IT-4511****Course Structure: Lectures: 3/Labs: 0****Credit Hours: 3****Prerequisites: CMP-2540(Computer Communication and Networks)****Course Objectives:**

This course will give an overview of systems and network administration based on both Windows and Linux environments. The objective are common system administration tasks and practices and how to implement and maintain standard services like email, file sharing, DNS and similar.

**Course Syllabus:**

Introduction to System Administration (SA).SA Components.Server Environment (Microsoft and Linux). Reliable Products, Understand the Cost of Server Hardware, Consider Maintenance Contracts and Spare Parts, Maintaining Data Integrity, Put Servers in the Data Center, Client Server OS Configuration, Providing Remote Console Access. Comparative Analysis of OS.Important Attributes, Key Features, Pros and Cons. Linux Installation and verification. Configuring Local services and managing basic system issues. Administer users and groups. Software Management.Managing Network Services and Network monitoring tools. Boot Management and Process Management. IP Tables and filtering.Securing network traffic. Advance File systems and logs: Bash Shell Scripting. Configuring Servers (FTP, NFS, Samba, DHCP, DNS and Apache).Configuring LYNC and Sharepoint 2010 on Windows Server 2008.

**Course Outline:**

1. Introduction to System Administration: Systems, SA Components, Building a Site from Scratch, Growing a Small Site, Going Global, Replacing Services, Moving a Data Center, Handling a High Rate of Office Moves, Assessing a Site (Due Diligence)

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2. Server Environment (Microsoft and Linux): Known for Reliable Products, Understand the Cost of Server Hardware, Consider Maintenance Contracts and Spare Parts, Maintaining Data Integrity, Put Servers in the Data Center, Client Server OS Configuration, Provide Remote Console Access
3. Comparative Analysis of most demanded OS: Important Attributes, Key Features, Pros and Cons
4. Linux Installation and verification
5. Configuring Local services and managing basic system issues
6. Administer users and groups
7. Software Management
8. Managing Network Services and Network monitoring tools
9. Boot Management and Process Management
10. IP Tables and filtering
11. Securing network traffic
12. Advance File systems and logs
13. Bash Shell Scripting
14. Configuring Servers (FTP, NFS, Samba) LAB
15. Configuring Servers Cont. (DHCP, DNS and Apache) LAB
16. Configuring LYNC and Sharepoint 2010 on Windows Server 2008 LAB

**Textbook(s):**

- The Practice of System and Network Administration, Second Edition by Thomas Limoncelli, Christina Hogan and Strata Chalup, Addison-Wesley Professional; 2<sup>nd</sup> Edition (2007). ISBN-10: 0321492668
- Red Hat Enterprise Linux 6 Bible: Administering Enterprise Linux Systems by William vonHagen, 2011

**Reference Material:**

- Studyguide for Practice of System and Network Administration by Thomas A. Limoncelli, Cram101; 2<sup>nd</sup> Edition (2011). ISBN-10: 1428851755
- Microsoft Windows Server 2008 R2 Administration Instant Reference by Matthew Hester and Chris Henley, ISBN-10: 0470525398.
- Networking Systems Design and Development by Lee Chao, CRC Press; 1st Edition (December 21, 2009). ISBN-10: 142009159X (TB2)
- Windows Administration Latest Edition, Microsoft Press
- Linux Administration Guide Latest Edition

**Course Title: Data & Network Security****Course Code: IT-4541****Course Structure: Lectures: 3/ Labs: 0****Credit Hours: 3****Prerequisites: IT-4511(System and Network Administration)****Course Syllabus:**

Network Security Overview, Understanding Defenses, Cryptography, Security Policies, Secure Design, Web Security, Router Security, Firewalls, Intrusion Detection System, Remote Access, Virtual Private Networks, Public Key Infrastructure, Wireless Security, Logging and Auditing, Case Studies.

**Course Outline:**

1. Network Security Overview: Defining Trust, Weaknesses and Vulnerabilities, Responsibilities for Network Security, Security Objectives, the Need for Security, Risk and Vulnerability, TCP/IP Suite Weaknesses, Buffer Overflows, Spoofing Techniques.

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7th Term

- Social Engineering. [TB1: Ch. 1,2]
2. Understanding Defenses: Digital IDs, Intrusion Detection System, PC Card-Based Solutions, Physical Security, Encrypted Login, Firewalls, Reusable Passwords, Antivirus Software, Encrypted Files, Biometrics. [TB1: Ch. 3]
  3. Cryptography: Introduction, Cryptography versus Cryptanalysis, Modern-Day Techniques. [TB1: Ch. 4]
  4. Security Policies: Defining a Security Policy, Importance of a Security Policy, Development Process, Incident Handling Process, Security Wheel, Sample Security Policy. [TB1: Ch. 5]
  5. Secure Design: Network Design-Principles, Network Design-Methodology, Return on Investment, Physical Security Issues, Switches and Hubs. [TB1: Ch. 6]
  6. Web Security: Hardening, Case Study. [TB1: Ch. 7]
  7. Router Security: Basic Router Security, Router Security to Protect the Network, CBAC, Case Study. [TB1: Ch. 8]
  8. Firewalls: Firewall Basics, Different Types of Firewalls, Enhancements for Firewalls, Placing Filtering Routers and Firewalls. [TB1: Ch. 9]
  9. Intrusion Detection System: Introduction to Intrusion Detection, Host-Based IDSs, Network-Based IDSs, IDS Management Communications-Monitoring the Network, Sensor Maintenance, Case Study: Deployment of IDS Sensors in the Organization and Their Typical Placement. [TB1: Ch. 10]
  10. Remote Access: AAA Model, AAA Servers, Lock-and-Key Feature, Two-Factor Identification, Case Study: Configuring Secure Remote Access. [TB1: Ch. 11]
  11. Virtual Private Networks: Generic Routing Encapsulation Tunnels, IP Security, VPNs with IPsec, Case Study: Remote Access VPN. [TB1: Ch. 12]
  12. Public Key Infrastructure: Public Key Distribution, Trusted Third Party, PKI Topology, Enrollment Procedure, Revocation Procedure, Case Study: Creating Your Own CA. [TB1: Ch. 13]
  13. Wireless Security: Different WLAN Configurations, What Is a WLAN? How Wireless Works, Risks of Open Wireless Ports, War-Driving and War-Chalking, SAFE WLAN Design Techniques and Considerations, Case Study: Adding Wireless Solutions to a Secure Network. [TB1: Ch. 14]
  14. Logging and Auditing: Logging, SYSLOG, Simple Network Management Protocol, Remote Monitoring, Service Assurance Agent, Case Study. [TB1: Ch. 15]

**Textbook(s):**

- Network Security Fundamentals by Gert DeLaet and Gert Schauwers, Cisco Press; 1<sup>st</sup> Edition (September 18, 2004). ISBN-10: 1587051672

**Reference Material:**

- Network Security Bible by Eric Cole, Wiley; 2<sup>nd</sup> Edition (September 8, 2009). ISBN-10: 0470502495
- Network Security Essentials: Applications and Standards by William Stallings, Prentice Hall; 4<sup>th</sup> Edition (March 22, 2010). ISBN-10: 0136108059
- Security in Computing by Charles P. Pfleeger and Shari Lawrence Pfleeger, Prentice Hall; 4<sup>th</sup> Edition (2006). ISBN-10: 0132390779
- CISSP All-in-One Exam Guide, 6<sup>th</sup> Edition by Shon Harris, McGraw-Hill Osborne Media; 6<sup>th</sup> Edition (2012). ISBN-10: 0071781749
- Hacking Exposed 7: Network Security Secrets & Solutions, Seventh Edition by Stuart McClure, Joel Scambray and George Kurtz, McGraw-Hill Osborne Media; 7<sup>th</sup> Edition (2012). ISBN-10: 0071780289

**Course Title: Cloud Computing**

**Course Code: IT-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. Ritting-

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- house 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; 1<sup>st</sup> Edition (2009). ISBN-10: 0136009220.
- Cloud Computing Bible by Barrie Sosinsky, Wiley; 1<sup>st</sup> 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; 1<sup>st</sup> Edition (2009). ISBN-10: 0596156367.
- Securing the Cloud: Cloud Computer Security Techniques and Tactics by Vic (J.R.) Winkler, Syngress; 1<sup>st</sup> Edition (2011). ISBN-10: 1597495921.
- Private Cloud Computing: Consolidation, Virtualization, and Service-Oriented Infrastructure by Stephen R Smoot and Nam K Tan, Morgan Kaufmann; 1<sup>st</sup> Edition (2011). ISBN-10: 0123849195.

**Course Title: System Integration and Architecture**

**Course Code: IT-4344**

**Course Structure: Lectures: 3 / Labs: 0**

**Credit Hours: 3**

**Prerequisites: CMP-3310 (Software Engineering)**

**Course Objectives:**

The course aims to teach student about system integration issues, including integration in a system of systems and federation of systems, role of architectures in systems integration, performance and effectiveness.

**Course Syllabus:**

Enterprise Architecture (EA) and Enterprise Engineering (EE). Balanced Scorecard and Strategy Maps (BSSM). Using Strategy Analysis (SA). Governance Analysis Using EA. Enterprise Architecture Methods. Using Business-Driven Data Mapping for Integrated Data. Strategic Modeling for Rapid Delivery of EA. Strategic Alignment, Activity and Workflow Modeling, and Business Rules. Using Business Normalization for Future Business Needs. Menu Design, Screen Design, Performance Analysis, and Process Modeling. Enterprise Application Integration Concepts. Enterprise Portal Technologies for Integration. Web Services for Real-Time Integration. Service-Oriented Architecture for Integration. Managing and Delivering EA. Future Directions in EA and Integration.

**Course Outline:**

1. Enterprise Architecture (EA) and Enterprise Engineering (EE): The Evolution of EA, Zachman Framework for EA, EE for Rapid Development, Using EA of Enterprise Integration. [TB: Ch. 1]
2. Balanced Scorecard and Strategy Maps (BSSM): Introduction, Basic Concepts of Balanced Scorecard, Basic Concepts of Strategy Maps, Examples of BSSM, Steps to Develop BSSM. [TB: Ch. 2]
3. Using Strategy Analysis (SA) to Define the Future: SA in Business Planning, The Steps of SA, SA for Project Specifications, Preparation for SA, Questionnaire Templates for EA. [TB: Ch. 3]

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4. Governance Analysis Using EA: Responsibilities Imposed by Sarbanes-Oxley, Governance Analysis Framework for Sarbanes-Oxley, Step-by-Step Approach for Governance Analysis. [TB: Ch. 4]
5. Enterprise Architecture Methods: Methods for Building EA, Evolution of Systems Development Methodologies, Government Methods for Building EA, Department of Defense Architecture Frameworks, The Open Group Architecture Framework, EA Project Experience, Strategies for EA Implementation, EE for EA. [TB: Ch. 5]
6. Using Business-Driven Data Mapping for Integrated Data: EA Incremental Build Context, Data Modeling Conventions, Data Entity Types, Data Attribute Types. [TB: Ch. 6]
7. Strategic Modeling for Rapid Delivery of EA: EA Incremental Build Context, Developing Strategic Models, Identifying Business Activities from a Data Map, Deriving Project Plans for Rapid EA Delivery, Case Study Entity Dependency Problems. [TB: Ch. 7]
8. Strategic Alignment, Activity and Workflow Modeling, and Business Rules: EA Incremental Build Context, Define Strategic Alignment Matrices, Activity Modeling Concepts, Activity-Based Costing, Workflow Modeling, Business Rules for Workflow Modeling. [TB: Ch. 8]
9. Using Business Normalization for Future Business Needs: EA Incremental Build Context, Introduction to Normalization, 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup>, and 4<sup>th</sup> Business Normal Form, Identifying Current and Future Business Needs, Capturing Expert Business Knowledge. [TB: Ch. 9]
10. Menu Design, Screen Design, Performance Analysis, and Process Modeling: EA Incremental Build Context, Initial Menu Structure from a Data Model, Preliminary Screen Designs from a Data Model, Database Capacity Planning and Transaction Performance, Prototyping from a Data Model, Process Modeling. [TB: Ch. 10]
11. Enterprise Application Integration Concepts: Technologies for Enterprise Integration, B2B Cost-Effective Business Drivers, XML Messaging and Repository Standards, ebXML, EAI Vendors and Products. [TB: Ch. 11]
12. Enterprise Portal Technologies for Integration: The Evolution of Enterprise Portals, Enterprise Portal Product Categories, Enterprise Portal Product Descriptions. [TB: Ch. 12]
13. Web Services for Real-Time Integration: Introduction to Web Services, Intranet and Internet Web Services for Integration, XML Standards for Web Services, Web Services Evolution, Challenges in Phase 3 Evolution, Web Services Products. [TB: Ch. 13]
14. Service-Oriented Architecture for Integration: Importance of Service-Oriented Architecture, Introduction to Service-Oriented and Event-Driven Architectures, SOA Business Process Management Products. [TB: Ch. 14]
15. Managing and Delivering EA: Virtualization and On-Demand Computing, Costs of Integration, Role of Modeling Tools, Modeling Tool Products and Directions, Key EA Principles, Future Directions in EA. [TB: Ch. 15]

**Textbook(s):**

- Enterprise Architecture for Integration: Rapid Delivery Methods and Technologies by Clive Finkelstein, Artech House Print on Demand; 1<sup>st</sup> Edition (March 31, 2006). ISBN-10: 1580537138

**Reference Material:**

- Systems Integration (Systems Engineering) by Jeffrey Grady, CRC-Press; 1<sup>st</sup> Edition (September 30, 1994). ISBN-10: 0849378311
- The Business of Systems Integration by Andrea Prencipe (Editor), Andrew Davies

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(Editor), Mike Hobday (Editor). Oxford University Press, USA (June 30, 2005). ISBN-10: 019926323X

- Enterprise Integration: An Architecture for Enterprise Application and Systems Integration by Fred A. Cummins, Wiley; 1<sup>st</sup> Edition (February 14, 2002). ISBN-10: 0471400106

**Course Title: Technology Management**

**Course Code: IT-3431**

**Course Structure: Lectures: 3/Labs: 0**

**Credit Hours: 3**

**Prerequisites: None**

**Course Objectives:**

This course introduces students with the management issues surrounding technology. It will encourage students to consider the use of information technology for strategic advantage, and to provide practical understanding of the tools and concepts of technology management.

**Course Syllabus:**

Introduction to Technology Management, TM activities and tools, The TM framework, TM activities behind technological capabilities. TM Activities: Identification, Selection, Acquisition, Exploitation, Protection, Learning. TM Tools. TM Tools-Patent Analysis. TM Tools-Portfolio Management. TM Tools-Roadmapping. TM Tools-Value Analysis/Value Innovation. TM-Functions: Planning and Forecasting, Decision Making, Organizing, Leading Technical People.

**Course Outline:**

1. Introduction to Technology Management; TM activities and tools, The TM framework, TM activities behind technological capabilities, TM tools, Cases illustrating different TM system configurations. [TB 1: Ch. 1]
2. TM Activities – Identification: Introduction, Definition, Identification processes, Case study. [TB 1: Ch. 2]
3. TM Activity- Selection: Introduction, Definition, Selection processes, Case study. [TB 1: Ch. 3]
4. TM Activity – Acquisition: Introduction, Definition, Internal acquisition, R&D processes, External technology acquisition, External acquisition processes, Case study. [TB 1: Ch. 4]
5. TM Activity – Exploitation: Introduction, Definition, Commercialization/marketing, Marketing processes, Technology transfer, Technology utilization, Utilization processes, Case study. [TB 1: Ch. 5]
6. TM Activity- Protection: Introduction, Definition, Protection processes, Case study. [TB 1: Ch. 6]
7. TM Activity – Learning: Introduction, Definition, Learning processes, Case study. [TB 1: Ch. 7]
8. TM Tools-S –curve: Introduction, Where and why it is used, Process, Case study. [TB1: Ch. 8]
9. TM Tools-Patent Analysis: Introduction, Where and why it is used, Process, Case study. [TB1: Ch. 10]
10. TM Tools-Portfolio Management: Introduction, Where and why it is used, Process, Case study. [TB 1: Ch. 11]
11. TM Tools-Roadmapping: Introduction, Where and why it is used, Process, Case study. [TB 1: Ch. 12]
12. TM Tools-Value Analysis/Value Innovation: Introduction, Where and why it is used, Process, Case studies. [TB 1: 13]

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13. TM-Functions - Planning and Forecasting: Nature of Planning, The Foundation For Planning, Planning Concepts, Forecasting, Strategies For Managing Technology. TM-Functions - Decision Making: Nature of Decision Making, Management Science, Tools for Decision Making, Computer-Based Information Systems, and Implementation. [TB 2: Ch. 3]
14. TM-Functions – Organizing: Nature of Organizing, Traditional Organization Theory, Technology and Modern Organization Structures, Teams, Staffing Technical Organizations, Authority and Power, Delegation, Committees and Meetings, Teams. [TB2: Ch. 5]
15. TM-Functions - Leading Technical People: Leadership, Motivation, Motivating and Leading Technical Professionals. Controlling: The Process of Control, Financial Controls. [TB 2: Ch. 7]

**Textbook(s):**

- Technology Management: Activities and Tools by Dilek Cetindamar, Rob Phaal, and David Probert, Palgrave Macmillan (April 27, 2010). ISBN-10: 0230233341 (TB1)
- Managing Engineering and Technology by Lucy C. Morse And Daniel L. Babcock, Prentice Hall; 5<sup>th</sup> Edition (August 20, 2009). ISBN-10: 0136098096 (TB2)

**Reference Material:**

- Management of Technology: Managing Effectively in Technology-Intensive Organizations by Hans J. Thamhain, Wiley; 2<sup>nd</sup> Edition (May 25, 2005). ISBN-10: 0471415510
- Managing Information Technology by Carol V. Brown, Daniel W. DeHayes, Jeffrey A. Hoffer, Wainright E. Martin, and William C. Perkins, Prentice Hall; 7<sup>th</sup> Edition (March 18, 2011). ISBN-10: 0132146320
- Technology Management: Activities and Tools by Dilek Cetindamar, Rob Phaal, and David Probert, Palgrave Macmillan (April 27, 2010). ISBN-10: 0230233341

## **Contents of Information Technology Supporting Courses**

**Course Title: IT Project Management****Course Code: IT-4349****Course Structure: Lectures: 3/ Labs: 0****Credit Hours: 3****Prerequisites: CMP-3310 (Software Engineering)****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 Soft-  
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- ware 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 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; 5<sup>th</sup> Edition (2009). ISBN-10: 0077122798
- A Guide to the Project Management Body of Knowledge, 3<sup>rd</sup> Edition (PMBOK Guides), ISBN-13: 978-1930699458

**Reference Material:**

- Applied Software Project Management by Andrew Stellman and Jennifer Greene,

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O'Reilly Media; 1<sup>st</sup> Edition (2005). ISBN-10: 0596009488

- Software Project Survival Guide (Pro -- Best Practices) by Steve McConnell, Microsoft Press; 1<sup>st</sup> 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; 6<sup>th</sup> Edition (2011). ISBN-10: 111801619X
- The Software Project Manager's Handbook - Principles that work at work by Dwayne Phillips, 2<sup>nd</sup> Edition, IEEE Computer Society Press and Wiley Inter-science, 2004. ISBN 0-471-67420-6

**Course Title: Internet Architecture and Protocols**

**Course Code: IT-3513**

**Course Structure: Lectures: 3 / Labs: 0**

**Credit Hours: 3**

**Prerequisites: CMP-2540 (Computer Communications and Networks)**

**Course Objectives:**

This course investigates the design principals of Internet. Students will learn the structure of the Internet and related protocols.

**Course Syllabus:**

Terms and Concepts. Functioning of the Internet. Review of The TCP/IP Model. Network Layer Addresses (IP Addresses). DHCP. DNS Servers & Configuration. Error Recovery Operations. Internet Local Area Networks (LANs). IEEE Standards. (CSMA/CD) LANs. CSMA/CD Protocol Stacks. Review of Ethernet. CSMA/CD Frames. Subnetwork Access Protocol (SNAP). CSMA/CD. Ethernet Layers. CSMA/CD Standards. The Token Ring Network. The Ring Configuration. FDDI. FDDI Configuration. The FDDI Layers. FDDI Backbones. Switched LANs. Fast Ethernet. Fast Ethernet and the Layered Model. Auto-Negotiation. Gigabit Ethernet. Internet Wide Area Networks (WANs). Message Switching and Packet Switching. Frame Relay. Cell Relay. Comparing WAN Technologies. X.25, Frame Relay, and ATM Virtual Circuits. Mapping IP Addresses to "Labels": Label or Tag Switching. IP and ICMP. ICMP. Time-to-Live. Destination Unreachable. Redirect. Router Discovery. Pings. IPv6. TCP and UDP. Round Trip Time (RTT). Nagle's Algorithm ReExamined. The Slow Start. Congestion Window and Threshold Size. The User Datagram Protocol (UDP). The Point-to-Point Protocol (PPP) and The Layer 2 Tunneling Protocol (L2TP). Routing Protocols.

**Course Outline:**

1. Introduction. Terms and Concepts. Functioning of the Internet. Review of The TCP/IP Model. Network Layer Addresses (IP Addresses). The IP Address Format. Special Rules for Addresses. IP Address Space. Address Resolution (Mapping). The Address Resolution Protocols. ARP. Proxy ARP. Reverse ARP. Bootstrap Protocol (BOOTP). DHCP. Introduction to Subnets and Subnet Addressing. Introduction to the Domain Name System (DNS). DNS Servers. The DNS Configuration. [TB: Ch. 1]
2. Error Recovery Operations: Introduction. Data Transfer across Links. The Basic Operations. Relationship of the Link Layer to the OSI Model. Link Layer Primitives (Service Definitions). [TB: Ch. 2]
3. The Link Timers. State Variables and Sequence Numbers. Transmit and Receive Windows. The High Level Data Link Control (HDLC). The HDLC Frame. The FCS Check. Error. Checking. End-to-End Error Recovery by TCP. [TB: Ch. 2]

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4. Internet Local Area Networks (LANs): Introduction to LAN, Notations and Topologies. IEEE Standards. Carrier Sense Multiple Access/Collision Detection (CSMA/CD) LANs. CSMA/CD Protocol Stacks. Review of Ethernet. CSMA/CD Frames. [TB: Ch. 3]
5. Subnetwork Access Protocol (SNAP). CSMA/CD in Action. Ethernet Layers. The Various CSMA/CD Standards. The Token Ring Network. The Ring Configuration. FDDI. FDDI Configuration. The FDDI Layers. FDDI Backbones. Switched LANs. Fast Ethernet. Comparing Ethernet and Fast Ethernet. Fast Ethernet and the Layered Model. Auto-Negotiation. Gigabit Ethernet. [TB: Ch. 3]
6. Internet Wide Area Networks (WANs): Typical Functions of a WAN Network Layer. WAN Interfaces. Placement of Functions. Connection-Oriented and Connectionless Networks. Relaying Data through the WAN. [TB: Ch. 4]
7. Review of Circuit Switching, Message Switching and Packet Switching. Frame Relay. Cell Relay. Comparing WAN Technologies. X.25, Frame Relay, and ATM Virtual Circuits. Mapping IP Addresses to "Labels": Label or Tag Switching. [TB: Ch. 4]
8. IP and ICMP: Attributes of IP. Processing the Datagram. Routing Table. Secondary Addresses in the Table. The IP Header. The IP Addresses Options Field. Subnetting. Address Aggregation. CIDR. Variable Length Submasks (VLSMs). Address Processing Overhead. Fragmentation. [TB: Ch. 5]
9. ICMP. Time-to-Live. Destination Unreachable. Redirect. Router Discovery. Pings. IPv6. Design Intent for IPv6. Hierarchical Address. Format of IPv6 Datagram. Extension Headers. ICMP and IPv6. Transition to IPv6. [TB: Ch. 5]
10. TCP and UDP: Protocol Placement of TCP and UDP. TCP: End-to-End Communications. Internet Traffic Characteristics. Arrival of Traffic. Bulk and Interactive Traffic. Internet Ports. Port Operations. Sockets. TCP and Interactive Traffic. TCP and Bulk Traffic. The TCP Header (Segment). The TCP Open. TCP Data Transfer Operations. TCP Close. TCP Traffic Management. TCP Timer. [TB: Ch. 6]
11. Round Trip Time (RTT). Nagle's Algorithm ReExamined. The Slow Start. Congestion Window and Threshold Size. The User Datagram Protocol (UDP). The UDP Header. Interfaces to TCP and UDP. Socket Calls. [TB: Ch. 6]
12. The Point-to-Point Protocol (PPP) and The Layer 2 Tunneling Protocol (L2TP): Introduction to PPP. PPP and Associated Protocols. Major Functions of LCP. HDLC Formats. Key Terms. PPP Frame Format. Auto-Detect Operations. The PPP Phases. Link Dead (physical layer not ready). Link Establishment Phase. Authentication Phase. Network Layer Protocol Phase. Link Termination Phase. The PPP Protocol Data Unit. [TB: Ch. 7]
13. The LCP Packets. LCP Options. IPCP for IP Support. PPP Authentication. PAP. CHAP. IPv6CP. L2TP. L2TP Terms and Concepts. L2TP Configuration. L2TP Tunnels. L2TP Protocol Stack. L2TP Operations. [TB: Ch. 7]
14. Routing Protocols: Introduction. The Routing Domain. Multiple Routing Domains. Routing and Forwarding. Protocol Stacks. Gateway. Types of Routing Protocols. Distance Vector. Link State Metric. Design Goals. Static, Stub, and Default Routes. Distance Vector Protocols. Link State Metric Protocols. Shortest Path First Operations. [TB: Ch. 8]

**Textbook(s):**

- Internet Architecture: An Introduction to IP Protocols by Uyles D. Black, Prentice Hall PTR; 1<sup>st</sup> Edition (2000). ISBN-10: 0130199060

**Reference Material:**

- Internet Routing Architectures by Sam Halabi, Cisco Press; 2<sup>nd</sup> Edition (2000).

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ISBN-10: 157870233X

- TCP/IP Protocol Suite by Behrouz A. Forouzan, McGraw-Hill Science/Engineering/Math; 4<sup>th</sup> Edition (2009). ISBN-10: 0073376043
- Next-Generation Internet: Architectures and Protocols, by Andrei Gurtov, Cambridge University Press (2011). ISBN-10: 0521113687

**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 Syllabus:**

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]

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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; 3<sup>rd</sup> 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. Rumbaugh and I. Jacobson, Addison-Wesley Professional; 2<sup>nd</sup> Edition (2005). ISBN-10: 0321267974.
- The Unified Modeling Language Reference Manual by James Rumbaugh, Ivar Jacobson and Grady Booch, Addison-Wesley Professional; 2<sup>nd</sup> 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; 3<sup>rd</sup> Edition (2003). ISBN-10: 0321197704.

**Course Title: Database Administration & Management**

**Course Code: IT-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.

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- 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).

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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 Niemi, McGraw-Hill Osborne Media; 1st Edition (2012). ISBN-10: 0071780262
- Online Material URL <http://otn.oracle.com>

**Course Title: Information Systems**

Course Code: IT-2410

Course Structure: Lectures: 3/Labs:0

Credit Hours: 3

Prerequisites: None

**Course Objective:**

The course will introduce students with basic concepts, system development life cycle, development themes, development methodologies, development tools and technologies of Information Systems.

**Course Syllabus:**

Information Systems Concepts, Types, Advantages, and Global Challenges. System Development Life Cycle, System Investigation, System Analysis, Systems Design, Environmental Design Considerations, System Implementations, Ethical and Social Issues, Systems Operations and Maintenance, Themes in Information Systems development, Techniques, System development, Techniques, Information Systems Development Tools and toolsets, Information Systems Development Methodologies.

**Course Outline:**

1. Introduction: Information Systems Concepts, Types of Information Systems: Business Information Systems, Transaction Processing Systems, Enterprise Resource Planning Systems, Knowledge Based Systems, Decision Support Systems, GIS Systems, etc., Competitive Advantages, Careers in IS, Global Challenges [TB1: Ch. 1]
2. Overview of System Development, System Development Life Cycle, Factors, Affecting Development Success. [TB1: Ch. 5]
3. System Investigation, System Analysis, Systems Design, Environmental Design Considerations, System Implementations, Ethical and Social Issues, Systems Operations and Maintenance. [TB1: Ch. 5]
4. Themes in information systems development: Organizational themes, People themes, Modeling themes, Rapid and evolutionary development, Engineering themes, External development. [TB2: Ch. 4,5,6,7,8,9]
5. Techniques: Holistic techniques, Data techniques, Process techniques, Object-oriented techniques. [TB2: Ch. 10, 11, 12, 13]
6. Techniques: Project management techniques, Organizational techniques, People techniques [TB2: Ch. 14, 15]
7. Information Systems Development Tools and toolsets [TB2: Ch. 18, 19]
8. Information Systems Development Methodologies: Process-Oriented Methodologies, Blended methodologies, Rapid Development Methodologies, People-Oriented Methodologies

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odologies, Organizational-Oriented Methodologies, Frameworks. [TB2: 20, 21, 22, 23, 24, 25]

**Textbook(s):**

1. Fundamentals of Information Systems by Ralph Stair and George Reynolds, Course Technology; 6<sup>th</sup> Edition (January 1, 2011). ISBN-10: 0840062184
2. Information Systems Development: Methodologies, Techniques & Tools by David Avison and Guy Fitzgerald, McGraw-Hill; 4<sup>th</sup> Edition (May 1, 2006). ISBN-10: 0077114175

**Reference Material:**

- Introduction to Information Systems: Supporting and Transforming Business by R. Kelly Rainer and Casey G. Cegielski, Wiley; 3<sup>rd</sup> Edition (June 16, 2010). ISBN-10: 0470473525
- Information Systems by Richard T. Watson, CreateSpace Independent Publishing Platform (March 20, 2012). ISBN-10: 1475074921
- Information Systems Analysis and Design by Shouhong Wang and Hai Wang, Universal Publishers (January 1, 2012). ISBN-10: 1612330754

## **Contents of Information Technology Elective Courses**

**Course Title: Enterprise Resource Planning Systems**

**Course Code: IT-4461**

**Course Structure: Lectures: 3/Labs: 0**

**Credit Hours: 3**

**Prerequisites: CMP-3450 (Database Systems)**

**Course Objectives:**

An ERP system is software that runs all areas of an organization including accounting and finance, HR, sales and distribution, production, purchasing and inventory. 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. 4]
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]

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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; 1<sup>st</sup> Edition (September 10, 2003). ISBN-10: 0072861126
- Enterprise Resource Planning by Bret Wagner by Ellen Monk, Course Technology; 3<sup>rd</sup> Edition (February 4, 2008). ISBN-10: 1423901797
- ERP Systems by Dimpi Srivastava by Aarti Batra, I K International Publishing House (February 15, 2010). ISBN-10: 9380578148

**Course Title: Information Technology Infrastructure****Course Code: IT-4543****Course Structure: Lectures: 3/Labs: 0****Credit Hours: 3****Prerequisites: IT-3541 (Network Design & Management),****Course Objectives:**

This course will include a discussion of information technology architectures including software systems, hardware, operating systems, databases, component technologies, networking, and architecture patterns. The course also covers management aspects as well.

**Course Syllabus:**

Definition of IT Infrastructure, Nonfunctional Attributes, Availability Concepts, Sources of Unavailability, Availability Patterns. Performance. Security Concepts. Datacenters. Servers: Availability, Performance, Security. Networking: Building Blocks, Availability, Performance, Security. Storage: Availability, Performance, Security. Virtualization: Availability, Performance, Security. Operating Systems: Building Blocks, Implementing Various OSs, OS availability, OS Performance, OS Security. End User Devices: Building Blocks, Device Availability, Performance, Security. IT Infrastructure Management. Service Delivery Processes. Service Support Processes. IT Ethics & Emerging Trends in IT.

**Course Outline:**

1. Definition of IT Infrastructure, Nonfunctional Attributes, Availability Concepts, Sources of Unavailability, Availability Patterns. [TB1: Ch.1]
2. Performance: Performance during Infrastructure Design, Sources of Performance Metrics, Performance Pattern. [TB1: Ch.2]
3. Security Concepts: Risk Management, Cryptography, Computer Crime, Security Patterns. [TB1: Ch.3]
4. Datacenters: Introduction & History, Building Blocks, Datacenter Availability, Datacenter Security. [TB1: Ch.4]
5. Servers: Building Blocks, Availability, Performance, Security [TB1: Ch.5]
6. Networking: Building Blocks, Availability, Performance, Security. [TB1: Ch.6]
7. Storage: History, Availability, Performance, Security. [TB1: Ch.7]
8. Virtualization: History, Availability, Performance, Security. [TB1: Ch.8]
9. Operating Systems: Building Blocks, Implementing Various OSs, OS availability, OS Performance, OS Security. [TB1: Ch.9]
10. End User Devices: Introduction & History, Building Blocks, Device Availability, Per-

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formance, Security. [TB1: Ch.10]

11. IT Infrastructure Management [TB2: Ch. 2]
12. Service Delivery Processes [TB2: Ch. 3]
13. Service Support Processes [ TB2: Ch. 4]
14. IT Ethics [[TB2: Ch.7]
15. Emerging Trends in IT [TB2: Ch.8]

**Textbook(s):**

- IT Infrastructure Architecture: Infrastructure building blocks and concepts by Sjaak-Laan, Lulu.com (November 5, 2011). ISBN-10: 1447881281
- IT Infrastructure and its Management by Prof Phalguni Gupta, Tata McGraw Hill Education Private Limited (October 6, 2009). ISBN-10: 0070699798

**Reference Material:**

- IT Architecture For Dummies byKalani Kirk Hausman and Susan Cook, For Dummies; 1<sup>st</sup> Edition (November 9, 2010). ISBN-10: 0470554231
- Standards Policy for Information Infrastructure by Brian Kahin and, Janet Abbate, The MIT Press (August 14, 1995). ISBN-10: 026211206X
- IT Architectures and Middleware: Strategies for Building Large, Integrated Systems by Chris Britton and Peter Bye, Addison-Wesley Professional; 2<sup>nd</sup> Edition (June 3, 2004). ISBN-10: 0321246942

**Course Title: Network Programming**

**Course Code: IT-3542**

**Course Structure: Lectures: 3/Labs: 0**

**Credit Hours: 3**

**Prerequisites: CMP-2122 (Programming Fundamentals)**

**Course Objectives:**

At the end of this course, students would be able to identify and describe the purpose of each component of the TCP/IP protocol suite. Develop large and complex client-server applications using TCP/IP. Understand the impact of multiple threads or processes for an application. Understand the approaches toward building a robust server. This course is about implementation of TCP/IP networking concepts, Socket programming in Linux and Windows environment, developing client/server applications using C language, advanced networking software concepts, Handling multiple processes and threads, sharing data or passing information between processes or threads (IPC).

**Course Syllabus:**

Introduction and TCP/IP. Transport Layer details: Sockets Introduction and Elementary TCP Sockets. I/O Multiplexing: Socket Options. Elementary UDP Sockets. Elementary Name and Address Conversions. IPv4 and IPv6 Interoperability. Daemon Processes and advanced I/O functions. Non-blocking I/O and ioctl operations. Routing Sockets, Broadcasting, Multicasting. Threads and Raw Sockets. Datalink Access & Streams.

**Course Outline:**

1. Introduction and TCP/IP: A Simple Daytime Client; Protocol Independence, Roadmap to Client/Server, BSD Networking, Unix standard, 64-bit Architectures. [Ch. 1]
2. Transport Layer details: UDP, TCP, SCTP, connections, port numbers, buffers etc [Ch. 2]
3. Sockets Introduction and Elementary TCP Sockets: Socket Address Structure, Arguments and Functions, TCP/IP client server Application [Ch. 3]

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4. I/O Multiplexing: The SELECT and POLL function with all aspects. [Ch. 6]
5. Socket Options: getsockopt and setsockopt functions, default, socket states, generic, IPv4, IPv6, ICMPv6 socket options etc. [Ch. 7]
6. Elementary UDP Sockets: sendto and recvfrom functions, UDP echo server and client, summary of UDP. [Ch. 8]
7. Elementary Name and Address Conversions. [Ch. 9]
8. IPv4 and IPv6 Interoperability. [Ch. 10]
9. Daemon Processes and advanced I/O functions. [Ch. 12, 13]
10. Non-blocking I/O and ioctl operations. [Ch. 15,16]
11. Routing Sockets, Broadcasting, Multicasting. [Ch. 17,18, 19]
12. Threads and Raw Sockets [Ch. 23, 25]
13. Datalink Access & Streams [Ch. 26, 33]

**Textbook(s):**

- UNIX Network Programming Volume I by Richard Steven, Prentice Hall; 2<sup>nd</sup> Edition (September 4, 1998). ISBN-10: 0130810819

**Reference Material:**

- Windows System Programming by Johnson M. Hart, Addison-Wesley Professional; 4<sup>th</sup> Edition (February 26, 2010). ISBN-10: 0321657748
- The Linux Programming Interface: A Linux and UNIX System Programming Handbook by Michael Kerrisk, No Starch Press; 1<sup>st</sup> Edition (October 28, 2010). ISBN-10: 1593272200
- Linux Kernel Development by Robert Love, Addison-Wesley Professional; 3<sup>rd</sup> Edition (July 2, 2010). ISBN-10: 0672329468
- System Software: An Introduction to Systems Programming by Leland L. Beck, Addison Wesley, (3<sup>rd</sup> Edition) (1996). ASIN: B0084YEEWO

**Course Title: Network Design and Management****Course Code: IT-3541****Course Structure: Lectures: 3 / Labs: 0****Credit Hours: 3****Prerequisites: CMP-2540 (Computer Communication and Networks)****Course Objectives:**

This course is aimed to prepare students to design and manage various aspects of organizational network.

**Course Syllabus:**

Analyzing Business Goals and Constraints. Top-Down Network Design Methodology. Characterizing the Existing Internetwork. Designing a Network Topology. Designing Models for Addressing and Numbering. Selecting Switching and Routing Protocols. Developing Network Security Strategies. Developing Network Management Strategies. Physical Network Design. Selecting Technologies and Devices for Enterprise Networks. Testing Network Design. Optimizing Network Design. Documenting Network Design. Network Management Standards & Models. SNMP Management.

**Course Outline:**

1. Analyzing Business Goals and Constraints: Using a Top-Down Network Design Methodology, Analyzing Business Goals, Analyzing Business Constraints. Analyzing Technical Goals and Tradeoffs: Scalability, Availability, Network Performance, Security, Manageability, Usability, Adaptability, Affordability, Making Network Design

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- Tradeoffs. [TB1: Ch. 1, 2]
2. Characterizing the Existing Internetwork: Characterizing the Network Infrastructure, Checking the Health of the Existing Internetwork. Characterizing Network Traffic: Characterizing Traffic Flow, Characterizing Traffic Load, Characterizing Traffic Behavior, Characterizing Quality of Service Requirements. [TB1: Ch. 3, 4]
  3. Designing a Network Topology: Hierarchical Network Design, Redundant Network Design Topologies, Modular Network Design, Designing a Campus Network Design Topology, Virtual LANs, Wireless LANs, Redundancy and Load Sharing in Wired LANs, Server Redundancy, Workstation-to-Router Redundancy, Designing the Enterprise Edge Topology, Secure Network Design Topologies. [TB1: Ch. 5]
  4. Designing Models for Addressing and Numbering: Guidelines for Assigning Network Layer Addresses, Designing a Model for Naming. [TB1: Ch. 6]
  5. Selecting Switching and Routing Protocols: Making Decisions as Part of the Top-Down Network Design Process, Selecting Switching Protocols, Selecting Routing Protocols, IP Routing. [TB1: Ch. 7]
  6. Developing Network Security Strategies: Network Security Design, Security Mechanisms, Modularizing Security Design. [TB1: Ch. 8]
  7. Developing Network Management Strategies: Network Management Design, Network Management Architectures, Selecting Network Management Tools and Protocols. [TB1: Ch. 9]
  8. Physical Network Design: Selecting Technologies and Devices for Campus Networks: LAN Cabling Plant Design, LAN Technologies, Selecting Internetworking Devices for a Campus Network Design, Example of a Campus Network Design. [TB1: Ch. 10]
  9. Selecting Technologies and Devices for Enterprise Networks: Remote-Access Technologies, Selecting Remote-Access Devices for an Enterprise, WAN Technologies, Example of a WAN Design. [TB1: Ch. 11]
  10. Testing Network Design: Using Industry Tests, Building and Testing a Prototype Network System, Writing and Implementing a Test Plan for Network Design, Tools for Testing a Network Design. [TB1: Ch. 12]
  11. Optimizing Network Design: Optimizing Bandwidth Usage with IP Multicast Technologies, Reducing Serialization Delay, Optimizing Network Performance to Meet Quality of Service Requirements, Cisco IOS Features for Optimizing Network Performance. Documenting Network Design: Responding to a Customer's Request for Proposal, Contents of a Network Design Document [TB1: Ch. 13, 14].

**Textbook(s):**

- Top-Down Network Design by Priscilla Oppenheimer, Cisco Press; 3<sup>rd</sup> Edition (September 3, 2010). ISBN-10: 1587202832 (TB1)

**Reference Material:**

- Networking Systems Design and Development by Lee Chao, CRC Press; 1<sup>st</sup> Edition (December 21, 2009). ISBN-10: 142009159X (TB2)
- Networks: Design and Management by Steven Karris, Orchard Publications (August 2002). ISBN-10: 0970951140
- Network Design: Management and Technical Perspectives by Teresa C. Piliouras and Kornel Terplan, CRC Press (August 19, 1998). ISBN-10: 0849334047
- Network Warrior by Gary A. Donahue, O'Reilly Media; 2<sup>nd</sup> Edition (May 13, 2011). ASIN: B004W8ZL3W
- Modeling and Tools for Network Simulation by Klaus Wehrle, Mesut Günes, and James Gross, Springer (September 23, 2010). ISBN-10: 3642123309
- The Practice of System and Network Administration by Thomas Limoncelli, Christi-

na Hogan, and Strata Chalup, Addison-Wesley Professional; 2<sup>nd</sup> Edition (July 15, 2007). ISBN-10: 0321492668

- Network Management: Principles and Practice by Mani Subramanian; Timothy A. Gonsalves and N. Usha Rani, Pearson Education India (2010). ISBN-10: 81-3172-759-9

*Jim* *10/10/13*

**Course Title: Mobile Application Development**

**Course Code: IT-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.Persisting 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, Persisting 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]

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

**Course Title: Enterprise Application Development****Course Code: IT-4744****Course Structure: Lectures: 3 / Labs: 0****Credit Hours: 3****Prerequisites: IT-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

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- 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; 2<sup>nd</sup> Edition, Prentice Hall (March 25, 2002). Print ISBN-10: 0-201-78790-3

**Reference Material:**

- Mastering Enterprise JavaBeans 3.0 by Sriganesh, 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; 2<sup>nd</sup> Edition (May 10, 2003). ISBN-10: 0131422464
- Sun Certified Enterprise Architect for Java EE Study Guide by Mark Cade and Humphrey Sheil, Prentice Hall; 2<sup>nd</sup> Edition (February 8, 2010). ISBN-10: 0131482033

**Course Title: E-Commerce Applications Development****Course Code: IT-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]

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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]

**Textbook(s):**

- PHP 5 E-commerce Development by Michael Peacock, Packt Publishing (January 20, 2010). ISBN-10: 184719964X

**Reference Material:**

- Introduction to E-Commerce by Jeffrey F. Rayport, McGraw-Hill, 2<sup>nd</sup> Edition (2007). ISBN-10: 0071232664
- E-Commerce by Kenneth Laudon and Carol Guercio Traver, Prentice Hall; 8<sup>th</sup> 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; 8<sup>th</sup> 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; 1<sup>st</sup> 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; 1<sup>st</sup> Edition (2010). ISBN-10: 0321656229

**Course Title: Computer Game Development****Course Code: IT-4741****Course Structure: Lectures: 3, Labs: 0****Credit Hours: 3**

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*8th Edition*

**Prerequisites: CMP-3112 (Data Structures & Algorithms)****Course Objectives:**

The course is design to teaching how to create a complete computer / video game from start to finish? What are the different elements to a game? What makes a great game?

**Course Syllabus:**

Introduction to Game Development, Platform and Player Modes, What Is The Framework? Goals And Genres? What Are The Possibilities? Player Elements, Player Motivation, Geographic, Psychographics. Demographics, Gender, Generation, Rating, Applying Player Market to Platform. Story and Character Development: Classic Charters, Traditional Story Structure, Story Element. Plot, Game Story Devices, Game Characters. Character Development Element, Point-of-view, Visual Character Development, Verbal Character Development, Movement. Visual Character Development, Verbal Character Development, Movements, Chracter Description, Game Storytelling and Documentation. Gameplay: Rules to Play, Interactivity Modes, Game theory, Challenges, Balance. Levels: Level Design, Structure, Time, Space. Interface: Playe-Centerd Design, Interface & Game Feature, Interface Types, Usability. Audio: Importance of Game Audio, Sound Effect, Voiceover, Music. Company Role, Team Roles, Tools, Business Side of Game Development. Production and Management, Development Phases, Game Documentation.

**Course Outline:**

1. Building The Foundation, Historical Elements How Did We Get Here
2. Platform And Player Modes, What Is The Framework? [TB: Ch. 2]
3. Goals And Genres? What Are The Possibilities? [TB: Ch. 3]
4. Player Elements, Player Motivation, Geographic, Psychographics. [TB: Ch. 4]
5. Demographics, Gender, Generation, Rating, Applying Player Market to Platform. [TB: Ch. 4]
6. Story and Character Development: Classic Charters, Traditional Story Structure, Story Element. [TB: Ch. 5]
7. Plot, Game Story Devices, Game Characters [TB: Ch. 5]
8. Character Development Element, Point-of-view, Visual Character Development, Verbal Character Development, Movement, [TB: Ch. 5]
9. Visual Character Development, Verbal Character Development, Movements, Chracter Description, Game Storytelling and Documentation [TB: Ch. 5]
10. Gameplay: Rules to Play, Interactivity Modes, Game theory, Challenges, balance [TB: Ch. 6]
11. Levels: Level Design, Structure, Time, Space. [TB: Ch. 7]
12. Interface: Playe-Centerd Design, Interface & Game Feature, Interface Types, Usability. [TB: Ch. 8]
13. Audio: The Importance of Game Audio, Sound Effect, Voiceover, Music. [TB: Ch. 9]
14. Role & Responsibilities: Company Role, Team Roles, Tools, Business Side of Game Development. [TB: Ch. 10]
15. Production and Management, Development Phases, Game Documentation [TB: Ch. 11]

**Textbook(s):**

- Game Development Essentials by Jeannie Novak, Delmar Cengage Learning; 3<sup>rd</sup> Edition (August 17, 2011). ISBN-10: 1111307652

**Reference Material:**

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- Game Development Essentials: An Introduction by Jeannie Novak, Delmar Cengage Learning; 3<sup>rd</sup> Edition (2011). ISBN-10: 1111307652
- Game Development Essentials: Mobile Game Development by Kimberly Unger and Jeannie Novak, Delmar Cengage Learning; 1<sup>st</sup> Edition (2011). ISBN-10: 1418052655
- Game Development Essentials: Game Interface Design by Kevin Saunders and Jeannie Novak, Delmar Cengage Learning; 2<sup>nd</sup> Edition (2012). ISBN-10: 1111642885
- Game Development Essentials: Online Game Development by Rick Hall and Jeannie Novak, Delmar Cengage Learning; 1 Edition (2008). ISBN-10: 1418052671
- Beginning 3D Game Development with Unity: All-in-one, multi-platform game development by Sue Blackman, Apress; 1<sup>st</sup> Edition (2011). ISBN-10: 1430234229
- Game Coding Complete by Mike McShaffry and David Graham, Course Technology PTR, 4<sup>th</sup> Edition, (2012). ISBN-10: 1133776574
- The Essential Guide to Flash Games: Building Interactive Entertainment with Action Script by Jeff Fulton and Steve Fulton, friends of ED; 1<sup>st</sup> Edition (2010). ISBN-10: 1430226145

### **Course Title: 3D Modeling & Animation**

**Course Code: IT-4742**

**Course Structure: Lectures: 3/ Labs: 0**

**Credit Hours: 3**

**Prerequisites: None**

#### **Course Objectives:**

This course utilizes concepts and tools that professionals apply to create games and illustrations as well as storytelling with 3d animation. This course will cover all related techniques needed to create 3D scenes including lighting, texturing and rendering.

#### **Course Syllabus:**

Introduction to 3D Modeling & Animation, History Of Computer Graphics and Special Effects. Polygons, Polygon Meshes, Extruding, Controlling Edges and Edges Loop, Subdividing and Simplifying, Combining Meshes, Polygon Count, Normals, UV Coordinates. NURBS, Advantages and Disadvantages of NURBS. Subdivision Surfaces. Deforming, Sculpting and Special Selections, Morph Targets, Lattices and Curves, Specialized Deformers, Managing Soft and Rigid Bodies. Managing Animation. Coloring, Shaders, Ray Tracing, Photon Mapping. Working with Textures, Shading, UV Mapping, Paining in 3D, Changing Geometry, Seamless Reporting Pattern, Multiple Maps. Light Effect. Virtual Camera, Faking Camera Effects, Matching Virtual Cameras to Real One, Cameras and Image Planes, Animating the Camera, Camera Views, Camera Movements. Environments, Rendering. Procedures and Graphs. Scripting. Animation Tools.

#### **Course Outline:**

1. Introduction to 3D Modeling & Animation, History Of Computer Graphics and Special Effects. [TB: Ch. 1, 2]
2. Polygons: From 2D To 3D, Understanding Polygon, Polygon Meshes, Extruding, Controlling Edges and Edges Loop, Subdividing and Simplifying, Combining Meshes, Polygon Count, Normals, UV Coordinates. [TB: Ch. 3]
3. NURBS: From Straight to Curve, Crafting and Modifying Curves, NURBS Surface, Advantages and Disadvantages of NURBS. Subdivision Surfaces: The Marriage of Polygon and NURBS. [TB: Ch. 4, 5]
4. Deforming, Sculpting and Special Selections, Morph Targets, Lattices and Curves, Specialized Deformers, Soft Bodies, Constrains, Skeletons and Muscles, Rigid Bodies. [TB: Ch. 6]
5. Rigging, Parent Child, Bones and Joints, Skeletons, Creating a Skeleton Rig, Joint

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- Limiting, Kinematics, Skinning, Rigid Building, Smooth Binding, Muscles, Other Uses for Joint. [TB: Ch. 7]
6. Animation, Basic Principles, Key Framing, Animation with Graphics, Motion Capture, Facial Animation, Automation, Fence-Post Errors, Animation Workflow. [TB: Ch. 8]
  7. Dynamics, Physics, Collision Detection, Particles, Hairs, Fluid Dynamics, Crowds and Population, Quality. [TB: Ch. 9]
  8. Coloring, Shaders, Ray Tracing, Photon Mapping. [TB: Ch. 10]
  9. Working with Textures, Shading, UV Mapping, Painting in 3d, Changing Geometry, Seamless Reporting Pattern, Multiple Maps. [TB: Ch. 11]
  10. Light Effect, Reflection, Refraction, Caustics, Translucency, Shadows. Lighting the Way, Light Properties, Types of Light, Objects as Light Source. [TB: Ch. 12, 13]
  11. Working with Camera, Virtual Camera, Faking Camera Effects, Matching Virtual Cameras to Real One, Cameras and Image Planes, Animating the Camera, Camera Views, Camera Movements. [TB: Ch. 14]
  12. Environments, Rendering [TB: Ch. 15, 16]
  13. Procedures and Graphs. Scripting [TB: Ch. 17, 18]
  14. Animation Tools

**Textbook(s):**

- 3D Art Essentials: The Fundamentals of 3D Modeling, Texturing, and Animation by Ami Chopine, Focal Press; 1<sup>st</sup> Edition (March 23, 2011). ISBN-10: 0240814711

**Reference Material:**

- Blender (latest Version)
- GIMP (latest), Photoshop (any)
- 3D Modeling, Animation, and Rendering: An Illustrated Lexicon, Color Edition by Michael E. Mortenson, CreateSpace Independent Publishing Platform (2010). ISBN-10: 1453728481
- The Complete Guide to Blender Graphics: Computer Modeling and Animation by John M. Blain, A K Peters/CRC Press; 1<sup>st</sup> Edition (2012). ISBN-10: 1466517034
- Digital Modeling by William Vaughan, New Riders; 1<sup>st</sup> Edition (2012). ISBN-10: 0321700899
- Blender Game Engine: Beginner's Guide by bacone Victor kuller, PacktPublishing (2012). ISBN-10: 1849517029

**Course Title: Artificial Intelligence****Course Code: IT-3810****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:**

Introduction to AI, Turing Test, Strong AI vs Weak AI, Heuristics, Applications and Methods, History of AI. Uninformed Search: Search in IS, Generate-and-Test Paradigm, Blind Search Algorithm. Informed Search: Heuristics, The Best-First Search, The Beam Search, The A\* Search, The Bidirectional Search. Search Using Game: Game Trees and Minimum, Game

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Theory. Logic in AI: Logic and Representation, Propositional Logic, Predicate Logic, Other Logics. Knowledge Representation: Search Tree, Production System, Objects, Frames, Scripts & the Conceptual Dependency System, Semantic Networks, Recent Approaches, Agents. Prolog Programming. Production Systems: Strong Methods vs. Weak Methods, Production System and Inference Methods, Stochastic Processes and Markov Chain. [Uncertainty in AI: Fuzzy Sets, Fuzzy Logic, Fuzzy Inference, Probability Theory and Uncertainty. [Expert Systems: Characteristics of ES, Knowledge Engineering, Knowledge Acquisition, Classical ES, Case-Based Reasoning. Neural Networks: Introduction, The Perceptron Learning Rule, Back propagation, Discrete Hopfield Networks, Application Areas. Evolutionary Computation: Simulated Annealing, Genetic Algorithms, Genetic, Genetic Programming. Natural Language Processing: History of NLP, Syntax and Formal Grammars, Syntax and Formal Grammar, Statistical Parsing, Hidden Markov Model, Wordnet, Question Answering System. Automated Planning: Planning Terminology, Planning as Search, Hierarchical Planning, Case-Based Planning, Planning Approaches to Learning System. Advanced Computer Games: Rote Learning and Generalization, Signature Table and Book Learning, Programing Methods, Search in Machines

### Course Outline:

1. Introduction: Turing Test, Strong AI vs Weak AI, Heuristics, Applications and Methods, History of AI. [TB: Ch. 1]
2. Uninformed Search: Search in IS, Genrate-and-Test Paradigm, Blind Search Algorithm. [TB: Ch. 2],
3. 3: Informed Search: Heuristics, The Best-First Search, The Beam Search, The A\* Search, The Bidirectional Search. [TB: Ch. 3]
4. Search Using Game: Game Trees and Minimum, Game Theory. [TB: Ch. 4]
5. Logic in AI: Logic and Representation, Propositional Logic, Predicate Logic, Other Logics. [TB: Ch. 5]
6. Knowledge Representation: Search Tree, Production System, Objects, Frames, Scripts & the Conceptual Dependency System, Semantic Networks, Recent Approaches, Agents.
7. Prolog Programming [Online Resources]
8. Production Systems: Strong Methods vs. Weak Methods, Production System and Inference Methods, Stochastic Processes and Markov Chain. [TB: Ch. 7].
9. Uncertainty in AI: Fuzzy Sets, Fuzzy Logic, Fuzzy Inference, Probability Theory and Uncertainty. [TB: Ch. 8]
10. Expert Systems: Characteristics of ES, Knowledge Engineering, Knowledge Acquisition, Classical ES, Case-Based Reasoning. [TB: Ch. 9].
11. Neural Networks: Introduction, The Perceptron Learning Rule, Back propagation, Discrete Hopfield Networks, Application Areas. [TB: Ch, 10]
12. Evolutionary Computation: Simulated Annealing, Genetic Algorithms, Genetic, Genetic Programming. [TB: CH. 11]
13. Natural Language Processing: History of NLP, Syntax and Formal Grammars, Syntax and Formal Grammar, Statistical Parsing, Hidden Markov Model, Wordnet, Question Answering System. [TB: Ch. 12]
14. Automated Planning: Planning Terminology, Planning as Search, Hierarchical Planning, Case-Based Planning, Planning Approaches to Learning System.[TB: Ch. 13]

### Textbook(s):

- Artificial Intelligence in the 21st Century by Stephen Lucci by Danny Kopec, Mercu-

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ry Learning and Information (May 18, 2012). ISBN-10: 1936420236

### Reference Material

- Artificial Intelligence: A Modern Approach, 2nd Edition, by Russell and Norvig, Prentice Hall
- Artificial Intelligence: A Systems Approach by M. Tim Jones, Jones and Bartlett Publishers, Inc; 1<sup>st</sup> Edition (December 26, 2008). ISBN-10: 0763773379

### Course Title: Routing & Switching

**Course Code: IT-4569**

**Course Structure: Lectures: 3/Labs: 0**

**Credit Hours: 3**

**Prerequisites: IT-3513 (Internet Architecture & Protocols)**

#### Course Objectives:

This course focuses on advanced IP addressing techniques, in Termediate routing protocols, command-line interface configuration of switches, Ethernet switching, VLANs, STP, and VTP. Emphasis will be placed on application and demonstration of skills acquired in prerequisite courses. Upon completion, students should be able to perform tasks related to VLSM, routing protocols, switching concepts and configuration, STP, VLANs, and VTP.

#### Course Syllabus:

Ethernet Basic: Ethernet Layer 1, Ethernet Layer 2, Switching and Bridging Logic, SPAN and RSPAN. VLANs, VLAN Trunking Protocols, VLAN Trunking: ISL and 802.1Q, Configuring PPPoE. Spanning Tree Protocol: 802.1d Spanning Tree Protocol, Optimizing Spanning Tree, Protecting STP, Troubleshooting Complex Layer 2 Issues. IP Addressing. IP Services. IP Forwarding (Routing). EIGRP. OSPF. IGP Routing. Fundamentals of BGP Operations. BGP Routing Policies. Wide Area Network. IP Multicasting. IP Multicast Routing.

#### Course Outline:

1. Ethernet Basic: Ethernet Layer 1, Ethernet Layer 2, Switching and Bridging Logic, SPAN and RSPAN. [TB: Ch. 1]
2. Virtual LANs and VLAN Trunking: VLANs, VLAN Trunking Protocols, VLAN Trunking: ISL and 802.1Q, Configuring PPPoE. [TB: Ch. 2]
3. Spanning Tree Protocol: 802.1d Spanning Tree Protocol, Optimizing Spanning Tree, Protecting STP, Troubleshooting Complex Layer 2 Issues. [TB: Ch. 3]
4. IP Addressing: IP Addressing & Subnetting, CIDR, Private Addressing, and NAT. [TB: Ch. 4]
5. IP Services: ARP, Proxy ARP, Reverse ARP, BOOTP, and DGCP; HSRP, VRRP, and GLBP; Syslog, Web Cache Communication Protocol, Implementing and Using: IP-SLA, NetFlow, Router IP Traffic Export, FTP, Embedded Event Manager, Remote Monitoring, TFTP Server, Secure Copy Protocol, HTTP and HTTPS Access, Telnet Access, SSH Access. [TB: Ch. 5]
6. IP Forwarding (Routing): IP Forwarding, Multilayer Switching, Policy Routing, Optimized Edge Routing and Performance Routing. [TB: Ch. 6]
7. EIGRP: Basic States, EIGRP Convergence, EIGRP Configuration, [TB: Ch. 7]
8. OSPF: OSPF Database Exchange, OSPF Design and LSAs, OSPF Configurations, Virtual Link Configuration, Configuring OSPF Authentication, OSPF Stub Router Configuration. [TB: Ch. 8]
9. IGP Routing: Routing Map, Prefix Lists, and Administrative Distance; Router Redistribution, Router Summarization, Default Routes, Troubleshooting Complex Layer 3 Issues. [TB: Ch. 9]

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10. Fundamentals of BGP Operations: Building BGP Neighbor Relationships, Building the BGP Table, Building the IP Routing Table. [TB: Ch. 10]
11. BGP Routing Policies: Routing Filtering and Routers Summarization, BGP Path Attributes and the BGP Decision Processes, Configuring BGP Policies. [TB: Ch. 11]
12. Wide Area Network: Point-to-Point Protocol, Frame Relay Concepts, Frame Relay Configuration. [TB: Ch. 15]
13. IP Multicasting: Need of Multicasting, Multicasting IP Addresses, Managing Distribution of Multicast Traffic with IGMP, LAN Multicast Optimizations. [TB: Ch. 16]
14. IP Multicast Routing: Basic, Dense-Mode Routing Protocols, LAN-Specific Issues with PIM-DM and PIM-SM, Sparse-Mode Routing Protocols. [TB: Ch. 17]

**Textbook(s):**

- CCIE Routing and Switching Certification Guide (4th Edition) by Wendell Odom, Rus Healy and Denise Donohue, Cisco Press; 4<sup>th</sup> Edition (December 18, 2009). ISBN-10: 1587059800

**Reference Material:**

- Packet Guide to Routing and Switching by Bruce Hartpence, O'Reilly Media (September 3, 2011). ISBN-10: 1449306551
- CCIE Routing and Switching v4.0 Quick Reference by Brad Ellis, Jacob Uecker and Steven Means, Cisco Press (October 4, 2010). ASIN: B00452V450

**Course Title: Introduction to Broadband Communication Systems**

Course Code: IT-4547

Course Structure: Lectures: 3/ Labs: 0

Credit Hours: 3

Prerequisites: CMP-2540 (Computer Communication and Networks)

**Course Syllabus:**

Fundamental Concepts. Internet Protocols & Services. Intranet And Extranet. X.25 And Frame Relay. Fiber Channel. Synchronous Optical Network (SONET). Virtual Private Network (VPN). ISDN AND BISDN: ISDN, BISDN, ISDN STANDARDS, ISDN Applications. Asynchronous Transfer Mode (ATM) Technology. Digital Subscriber Line Systems. Cable Modem Systems. Passive Optical Networks. Wireless Data Services. Personal Communications Service. Satellite Communication.

**Course Outline:**

1. Fundamental Concepts: Components of Broadband Communication Systems, Communications Network Architecture, Cable Broadband Data Network Architecture, The Importance of Broadband Network Architectures, The Future of Broadband Telecommunications, Internetworking Standards.
2. INTERNET: Internet Protocol Suite, IPv6: Next-Generation Internet, Quality of Service, Applications and Services, Voice over IP, Internet Security, Flow Control.
3. INTRANET AND EXTRANET: Intranet Overview, Extranet Overview, Intranet Technologies, Extranet Technologies, The Power-Law Rule for Intranets and Extranets, The Topology Models, Intranet and Extranet Applications, Extranet and Intranet Design Issues.

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4. X.25 AND FRAME RELAY: X.25 Technology, Frame Relay, Frame Relay Standards, Frame Relay versus X.25, Voice over Frame Relay, Congestion Control, Frame Relay Applications.
5. FIBER CHANNEL: Basic Features, Fiber Channel Technology, Fiber Channel Topologies, Classes of Services, Benefits and Applications, Storage Area Networks.
6. SYNCHRONOUS OPTICAL NETWORK (SONET): SONET Signal, SONET Frame, SONET Components, SONET Topologies, Advantages and Disadvantages of SONET, Synchronous Digital Hierarchy, Next-Generation SONET (NGS), SONET and SDH Standards Including NGS.
7. VIRTUAL PRIVATE NETWORK (VPN): Types of VPN, VPN General Architecture, Current VPN Advantages and Disadvantages, VPN Security Issues, VPN Standards.
8. ISDN AND BISDN: ISDN, BISDN, ISDN STANDARDS, ISDN Applications
9. ASYNCHRONOUS TRANSFER MODE (ATM): ATM Technology, ATM Network, ATM Service Classes, ATM Standards, ATM LAN Emulation, ATM Applications, Traffic Management, Advantages and Disadvantages
10. Digital Subscriber Line Systems: DSL System Technology, DMT Line Code for ADSL, DMT Scheme, The Benefits and Disadvantages of Using DMT, OFDM Encoder, Cap Line Code for ADSL, QAM Basic Equations, CAP Basic Equations, CAP Passband Filtering, CAP Transceiver, Architectural Considerations, Comparing CAP and QAM, Observations, HDSL, SDSL, SHDSL, RADSL, IDSL, CDSL, VDSL, Future of DSL Systems and Broadband Systems, XDSL Standards, XDSL Standards Compliance.
11. Cable Modem Systems: Cable Modem Technology, External Cable Modem, Internal Cable Modem, Interactive Set-Top Cable Box, Cable Internet Access, Using QPSK and QAM in Cable Modem Systems, Comparison between Broadband DSL and Cable Modem Technologies, Cable Modem Systems Standards Compliance.
12. Passive Optical Networks: Basic Operational Principles of PON, The Various Types of PON Architectures, Comparative Analysis of PON Technologies and Architectures, Advantages of TDM PON, Disadvantages of TDM PON, Advantages of WDM PON, PON Security Issues, Passive Optical Network Standards.
13. Wireless Data Services: Wireless LAN, Wireless ATM, Wireless PAN, Cellular Communications, Cellular Digital Packet Data, WiMAX, Wireless Standards, Generations of Wireless Networks.
14. Personal Communications Service: Personal Communications Systems, Basic Features of PCS, PCS Solutions, PCS Architecture, PCS Standard, PCS Satellite Services, PCS Access Methods.
15. Satellite Communication: Fundamentals Orbital Characteristics, Propagation Characteristics, Broadband Communications to Land and Sea Locations, Broadband Airborne Mobile Satellite Communication, Applications

**Textbook(s):**

- Introduction to Broadband Communication Systems by Cajetan M. Akujuobi, Matthew N.O. Sadiku, Chapman and Hall/CRC (November 28, 2007). ISBN-10: 1420061496

**Reference Material:**

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- Broadband Telecommunications Handbook by Regis J. Bates; McGraw-Hill Companies (November 30, 1999). ISBN-10: 0071346481
- Deploying IPv6 in 3GPP Networks: Evolving Mobile Broadband from 2G to LTE and Beyond by Jouni Korhonen, Teemu Savolainen and Jonne Soininen. Wiley; 1 edition (May 28, 2013). ISBN-10: 1118398297

**Course Title: Web Engineering****Course Code: IT-4513****Course Structure: Lectures: 3/Labs: 0****Credit Hours: 3****Prerequisites: IT-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 Ap-

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plication 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 Gerti Kappel, Birgit Pröll, Siegfried Reich, Werner Retschitzegger, 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 1<sup>st</sup> Edition. 2006 Edition (November 9, 2010). ISBN-10: 3642066453
- Web Engineering: A Practitioner's Approach by Roger Pressman and David Lowe, McGraw-Hill Science/Engineering/Math; 1<sup>st</sup> Edition (January 22, 2008). ISBN-10: 0073523291
- Web Application Architecture: Principles, Protocols and Practices by Leon Shklar and Rich Rosen, Wiley; 2<sup>nd</sup> Edition (May 5, 2009). ISBN-10: 047051860X
- Web Engineering by Emilia Mendes and Nile Mosley, Springer; Softcover reprint of hardcover 1<sup>st</sup> 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: IT-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:

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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 Harmelen, and Rinke 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: IT-4545**

**Course Structure: Lectures: 3/Labs: 0**

**Credit Hours: 3**

**Prerequisites: IT-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 Android. 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 Memory

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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; 1<sup>st</sup> 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; 1<sup>st</sup> 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; 1<sup>st</sup> 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; 2<sup>nd</sup> 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: IT-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

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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, Multidimensional 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 Schemata, 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 Star 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 Matteo Golfarelli and Stefano Rizzi, McGraw-Hill Osborne Media; 1<sup>st</sup> Edition (May 26, 2009). ISBN-10: 0071610391

**Reference Material:**

- Building the Data Warehouse by William H. Inmon, Wiley; 4<sup>th</sup> 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 Paulraj Ponniah, Wiley; 2<sup>nd</sup> Edition (2010). ISBN-10: 0470462078
- Data Mining and Data Warehousing: Practical Machine Learning Tools Techniques by Ram Kumar Singh and Amit Asthana, LAP LAMBERT Academic Publishing (2012). ISBN-10: 3659118419

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**Course Title: Data Mining****Course Code: IT-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 Hierarchical 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]

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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 Mehmed Kantardzic, Wiley-IEEE Press; 2<sup>nd</sup> 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, Micheline Kamber and Jian Pei, Morgan Kaufmann; 3<sup>rd</sup> Edition (2011). ISBN-10: 0123814790
- Principles of Data Mining (Adaptive Computation and Machine Learning) by David J. Hand, Heikki Mannila 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 Amit Asthana, 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; 1<sup>st</sup> Edition (2003). ISBN-10: 1402076509
- Building the Data Warehouse by William H. Inmon, Wiley; 4<sup>th</sup> Edition (2005). ISBN-10: 0764599445

**Course Title: Business Intelligence and Analytics****Course Code: IT-4443****Course Structure: Lectures: 3 / Labs: 0****Credit Hours: 3****Prerequisites: IT-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:

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- 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, Scorecards 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; 2<sup>nd</sup> Edition (October 31, 2012). ISBN-10: 0123858895

**Reference Material:**

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

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- The Data Warehouse Mentor: Practical Data Warehouse and Business Intelligence Insights, by Robert Laberge, 1<sup>st</sup> Edition, McGraw-Hill Companies, (2012). ASIN: B008UYJJ8C
- Business Intelligence: A Managerial Approach by Turban, Sharda, Delen, King, 2<sup>nd</sup> 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: Advance Database Management**

**Course Code: IT-4444**

**Course Structure: Lectures: 3 / Labs: 0**

**Credit Hours: 3**

**Prerequisite: IT-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 Online 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 AC-ID 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

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- 1. 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; 6<sup>th</sup> Edition (January 27, 2010). ISBN-10: 0073523321
2. Database Systems – A Practical Approach to Design, Implementation and Management by Thomas Connolly and Carolyn Begg, 5<sup>th</sup> 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 Micheline Kamber, Morgan Kaufmann; 3<sup>rd</sup> 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 Sushil Jajodia (Editor), Springer; Softcover reprint of hardcover 1<sup>st</sup> Edition (November 4, 2010). ISBN-10: 1441943056

**Course Title: Information Systems Auditing and Assurance**

**Course Code: IT-4462**

**Course Structure: Lectures: 3/Labs: 0**

**Credit Hours: 3**

**Prerequisites: CMP-3450 (Database Systems)**

**Course Objectives:**

The course makes students acquainted with the profession of IS auditor, available frameworks, tools and standards.

**Course Syllabus:**

Introduction to Auditing, Assurance and Internal Control, IT Governance and Management, Organization Structure and Responsibilities, Business Continuity Planning, Auditing IT Governance, The Audit Process, Internal Controls, IT Life Cycle Management, Infrastructure Development and Implementation, Maintaining Information Systems, Business Processes, Application Controls, Auditing the Software Development Life Cycle, Auditing Business Controls, Auditing Application Controls, IT Service Delivery and Infrastructure, Disaster Recovery Planning, Information Asset Protection, Network Security Controls, Over view of Popular Methodologies, Framework and Guidelines, Overview of Computer-Assisted Audit Tools and Techniques.

**Course Outline:**

1. Introduction to Auditing, Assurance and Internal Control: Different Types of Audit, Audit Risks, IT Audit, Role of Audit Committee, Internal Audit Control. [TB1:1]
2. IT Governance and Management: IT Governance Practices for Executives and Boards of Directors, IT Strategic Planning, Policies, Processes, Procedures, and Standards, Risk Management. IT Management Practices. [TB2: Ch. 2]
3. Organization Structure and Responsibilities, Business Continuity Planning, Auditing IT Governance. [TB2: Ch. 2]

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4. The Audit Process: Audit Management, ISACA Auditing Standards, Risk Analysis, [TB2: Ch. 3]
5. Internal Controls, Performing an Audit, Control Self-Assessment, Implementation of Audit Recommendations [TB2: Ch. 3]
6. IT Life Cycle Management: Business Realization, Project Management, The Software Development Life Cycle (SDLC). [TB2: Ch. 4]
7. Infrastructure Development and Implementation, Maintaining Information Systems, Business Processes, Application Controls. [TB2: Ch. 4]
8. Auditing the Software Development Life Cycle, Auditing Business Controls, Auditing Application Controls. [TB2: Ch. 4]
9. IT Service Delivery and Infrastructure, Information Systems Operations, Information Systems Hardware, Information Systems Architecture and Software. [TB2: Ch. 5]
10. Disaster Recovery Planning, Auditing IS Infrastructure and Operations. [TB2: Ch. 5]
11. Information Asset Protection: Information Security Management, Logical Access Controls. [TB2: Ch. 6]
12. Network Security Controls, Environmental Controls, Physical Security Controls, Auditing Asset Protection [TB2: Ch. 6]
13. Over view of Popular Methodologies, Framework and Guidelines [TB2: Appendix B]
14. Overview of Computer-Assisted Audit Tools and Techniques: Application Controls, Testing Computer Application Controls, Computer- Aided Audit Tools and Techniques for Testing Controls. [TB1: Ch. 7]

**Textbook(s):**

1. Information Systems Auditing and Assurance by James A. Hall and Tommie Singleton, South-Western College Pub; 2<sup>nd</sup> Edition (July 27, 2004). ISBN-10: 0324191995
2. CISA® Certified Information Systems Auditor All-in-One Exam Guide By: Peter Gregory, McGraw-Hill Osborne Media; 2<sup>nd</sup> Edition (August 9, 2011). ISBN-10: 0071769102

**Reference Material:**

- Information Technology Control and Audit, Third Edition by Sandra Senft and Frederick Gallegos, Auerbach Publications; 3<sup>rd</sup> Edition (2008). ISBN-10: 1420065505
- Managing the Audit Function: A Corporate Audit Department Procedures Guide by Michael P. Cangemi and Tommie W. Singleton, Wiley; 3<sup>rd</sup> Edition (2003). ISBN-10: 0471281190
- COBIT 4.1 by IT Governance Institute, ISACA (2007). ISBN-10: 1933284722

**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

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**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; 2<sup>nd</sup> 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; 2<sup>nd</sup> 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

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- **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; 2<sup>nd</sup> 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; 2<sup>nd</sup> Edition (July 27, 2007). ISBN-10: 0123741521

### **Course Title: Knowledge Management**

**Course Code: IT-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, Embodied 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 Man-

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- agement: 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; 3rd Edition (March 4, 2011). ISBN-10: 0262015080

**Reference Material:**

- The Knowledge Management Toolkit: Orchestrating IT, Strategy, and Knowledge Platforms by AmritTiwana, Prentice Hall; 2<sup>nd</sup> 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

**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 and Specification, 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 Specifica-

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- tion, 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 Wieggers, 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

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

**Course Title: Software Design and 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. 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

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- 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.*

#### Text Book(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; 2<sup>nd</sup> Edition (April 19, 2003). ISBN-10: 0321154959

#### Reference Material:

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

**Course Title: Software Quality Engineering**

**Course Code: SE-4341**

**Course Structure: Lectures: 3/Labs: 0**

**Credit Hours: 3**

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**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

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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 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. Statistical Decision Theory-The Value of Information. Alternative Software Cost Estimation Methods. 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:

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- 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. Statistical Decision Theory: Expected Value of Perfect Information, Working with Imperfect Information, Bayes' Formula, Maximizing the Net Expected Value of the Prototype, Expected Value of Perfect Information, Expected Value of Imperfect Information, The Value of Information Procedure in S.E, Decision Guidelines, Pitfalls Avoided by Using the Value of Information Approach. Seven Basic Steps in Software Cost Estimation [TB: Ch 20, 21]
  10. Alternative Software Cost Estimation Methods: Algorithmic Methods, Expert Judgment, Estimation by Analogy, Parkinson Estimation, Price to Win, Top-Down & Bottom Up Estimating, Comparison of Methods [TB: Ch 22]
  11. 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]
  12. Detailed COCOMO Cost Drivers: Computer Attributes –Execution Time, Main Storage Constraint, Virtual Machine Volatility, Computer Turn Around Time [TB: Ch 25]
  13. Detailed COCOMO Cost Drivers-Personal Attributes: ACAP, AEXP, PCAP, VEXP, LEXP. [TB: Ch. 26]
  14. Detailed COCOMO Cost Drivers: Project Attributes-Modern Programming Practices, Use of Software Tools, Schedule Constraint [TB: Ch 27]

**Textbook(s):**

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

**Reference Material:**

- 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 Sunita Chulani, Prentice Hall (August 11, 2000). ISBN-10: 0130266922.

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- 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. Gerner, Thomas R. Gullede, William P. Hutzler, Springer London, Limited, 31-Jul-2012

**Course Title: Software CASE Tools & Applications**

**Course Code: SE-4344**

**Course Structure: Lectures: 3/Labs: 0**

**Credit Hours: 3**

**Prerequisites: CMP-3310 (Software Engineering)**

**Course Objectives:**

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 Re-

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use, 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; 1<sup>st</sup> Edition, (September 1, 1994) ISBN-10: 0195094786
- A [http://www.umsl.edu/~sauterv/analysis/6840\\_f09\\_papers/I%20Gusti/index.html](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 1<sup>st</sup> Edition 1996 (September 27, 2011). ISBN-10: 1461286263.
- Most popular software CASE tool documentation

**Course Title: Design Patterns**

**Course Code: SE-4345**

**Course Structure: Lectures: 3/ Lab: 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

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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; 2<sup>nd</sup> Edition (October 11, 2012). ISBN-10: 0956575846

**Reference Material:**

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

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

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.

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**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; 2<sup>nd</sup> Edition (July 7, 2004). ISBN-10: 0735619670

**Reference Material:**

- Compiler Construction (International Computer Science Series) by Niklaus Wirth.

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Addison-Wesley Pub (Sd); (1996). ISBN-10: 0201403536.

- Object-Oriented Software Construction (Book/CD-ROM) (2nd Edition) by Bertrand Meyer, Prentice Hall; 2<sup>nd</sup> 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; 2<sup>nd</sup> Edition (March 21, 2000). ISBN-10: 0136291554

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یونیورسٹی آف سرگودھا

SS-2311 - Islamic Studies

نصاب برائے اسلامیات لازمی کلاس BS 4 Years

باب اول: مطالعہ قرآن و حدیث

باب دوم: مطالعہ سیرت

باب سوم: مطالعہ تہذیب و تمدن

باب اول: مطالعہ قرآن و حدیث (Topical Study of Quran &amp; Hadith)

موضوعات

ارتوحید (دلائل کا عقلی و قلبی مطالعہ، تفکر و تدبیر)

آیات

۱. اللہ مافی السموات و مافی الارض وان تبدوا مافی انفسکم او تخفوه يحاسبکم به اللہ فيغفر لمن يشاء ويعذب من يشاء

شنتي قدير (البقرة: ۲۸۳)

۲. الم تر و ان اللہ سخر لکم مافی السموات و مافی الارض و اسغ علیکم نعمه ظاهرة و باطنة و من الناس من يجادل فی اللہ

هدى و لا کتاب منیر (لقمان: ۲۰)

۳. ربنا لانوا اخذنا ان نسينا و اخطانا ربنا و لا تحمل علينا اصرا کما حملته علی الذین من قبلنا ربنا و لا تحملنا ما لا طاقة

و اغفر لنا و ارحمنا انت مولانا فانصرنا علی القوم الکافرين (البقرة: ۲۸۶)

۴. سنريهم اياتنا فی الآفاق و فی انفسهم حتی يتبين لهم انه الحق اولم يكف بربک انه علی کل شیء شهيد (حم السجدة:

ان فی خلق السموات و الارض و اختلاف الليل و النهار لآیت الا لیاب (آل عمران: ۱۹۰)

۵. الذین یذکرون اللہ قیاما و قعودا و علی جنوبهم و یتفکرون فی خلق السموات و الارض ربنا ما خلقت هذا باطلا ، سبحا

عذاب النار (آل عمران: ۱۹۲)

احادیث

عن عمر بن الخطاب قال: قال رسول اللہ ﷺ: حين سئل عن الايمان ان تؤمن بالله و ملائکته و کتبه و رسله و الیوم الآخر و

بالقدر خیره و شره (متفق علیه)

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

آیات:

۱. امن الرسول ما انزل الیہ من ربه و المؤمنون کل امن بالله و ملائکته و رسله لا نفرق بین احد من رسله و قالوا سمعنا و اطعنا

ربنا و الیک المصیر (البقرة: ۲۳۵)

۲. یا ایہا الذین امنوا لا تقدموا بین یدی اللہ و رسوله و اتقوا اللہ ان اللہ سمیع علیم (الحجرات: ۱)

چتر سن

شعبہ علوم اسلامیات

یونیورسٹی آف سر

واخرى تحبها نصر من الله وافتح قريب وبشر المؤمنين. (الصف: ١١)

احاديث

١. عن ابن عمر قال: قال رسول الله ﷺ بنى الاسلام على خمس شهادة ان لا اله الا الله وان محمدا عبده ورسوله وقيام الصلوة والزكاة والحج وصوم رمضان (متفق عليه)

٢. عن شيرازي قال: قال رسول الله ﷺ مروا الصبي الصلوة اذا بلغ سبع سنين وادنا بلغ عشر سنين فاضربوه عليها وسنن داود، جامع ترمذى)

٣. عن ابي هريرة قال: قال رسول الله ﷺ من اتاه الله مالا فلم يود زكوة مثل له ماله يوم القيامة شجاعا اقرع له زبيتان يطوقه يوم الله ياخذ بلهزمتيه (يعنى شدائيه) ثم يقول انا مالك وانا كنزك ثم تلاوا يحسن الذين يخلون بما آتهم الله من فضله هو خير لهم بشر لهم يسيطون ما يخلوا به يوم القيامة..... الخ (بخارى)

٤. عن علي قال: قال رسول الله ﷺ من ملك زاد راحلته تبلغه الى بيت الله ولم يحج فلا عليه ان يموت يهوديا او نصرانيا وذلك تبارك وتعالى يقول ولدا على الناس حج البيت من استطاع اليه سبيلا (جامع ترمذى)

٥. صفات المؤمنين

آيات

١. وعباد الرحمن الذين يمشون على الارض هونا و اذا خاطبهم الجاهلون قالوا سلما. (الفرقان: ١)

٢. والذين يبيتون لربهم سجدا وقياما. (الفرقان: ٢)

٣. والذين يقولون ربنا اصرف عنا عذاب جهنم ان عذابها كان غراما. (الفرقان: ٣)

٤. انها ساءت مستقرا ومقاما. (الفرقان: ٤)

٥. والذين اذا انفقوا لم يسرفوا ولم يقتروا وكان بين ذلك قواما. (الفرقان: ٥)

٦. والذين لا يدعون مع الله الها اخر ولا يقتلون النفس التي حرم الله الا بالحق ولا يزنون ومن يفعل ذلك يلق اثاما. (الفرقان: ٦)

٧. يضغف له العذاب يوم القيمة ويخلد فيه مهانا. (الفرقان: ٧)

٨. الا من تاب وعمل صالحا فاولئك يبدل الله سيئاتهم حسنت وكان الله غفورا رحيما. (الفرقان: ٨)

٩. ومن تاب وعمل صالحا فانه يتوب الى الله متابا. (الفرقان: ٩)

١٠. والذين لا يشهدون الزور و اذا مروا باللغو مروا كراما. (الفرقان: ١٠)

١١. والذين اذا ذكروا بايت ربهم لم يخروا عليها صما وعميانا. (الفرقان: ١١)

١٢. والذين يقولون ربنا هب لنا من ازواجنا وذرينا قررة اعين واجعلنا للمتقين اماما. (الفرقان: ١٢)

١٣. اولئك يجزون الغرفة بما صبروا و يلقون فيها تحية وسلاما. (الفرقان: ١٣)

١٤. خلدين فيها حسنت مستقرا ومقاما. (الفرقان: ١٤)

١٥. قل ما يعيؤا بكم ربي لو لا دعاؤكم فقد كذبتم فسوف يكون لزاما. (الفرقان: ١٥)

١٦. والذين هم لفروجهم حافظون. (المؤمنون: ٣)

١٧. الا على ازواجهم او ما ملكت ايما نهم فانهم غير ملومين. (المؤمنون: ٥)

٦. والذين هم على صلواتهم يحافظون. (المؤمنون: ٦)

٧. اولئك هم اليراثون. (المؤمنون: ٧)

٨. الذين يرثون الفردوس. (المؤمنون: ٨)

٩. هم فيها خالدون. (المؤمنون: ٩)

#### احاديث

١. عن انس قال: قال رسول الله ﷺ والذي نفسى بيده لا يؤمن عبد حتى يحب لا خيه ما يحب لنفسه (متفق عليه)

٢. عن النعمان بن بشير قال: قال رسول الله ﷺ ترى المؤمنين في تراحمهم وتوادهم وتعاطفهم كمثل الجسد اذا اشتكى عضو له سائر الجسد بالسهر والحمى (متفق عليه)

#### ٦ آداب معاشرت

١. وان طائفتان من المؤمنين اقاتلوا فاصلحوا بينهما فان بغت احدهما على الاخرى فقاتلوا التي تبغى حتى تفيء الى امر الله فان قاتلت فاصلحوا بينهما بالعدل واقتسوا ان الله يحب المقسطين. (الحجرات: ٩)

٢. انما المؤمنون اخوة فاصلحوا بين اخويكم واتقوا الله لعلكم ترحمون. (الحجرات: ١٠)

٣. يا ايها الذين امنوا لا يستخرف قوم من قوم عسى ان يكونوا خيرا منهم ولا نساء من نساء عسى ان يكن خيرا منهن ولا تلمزوا وانفسكم ولا تنازروا وبالالقباب بنس الاثم الفسوق بعد الايمان ومن لم يتب فاولئك هم الظالمون. (الحجرات: ١١)

٤. يا ايها الذين امنوا اجتنبوا كثير من الظن ان بعض الظن اثم ولا تجسسوا ولا يغتب بعضكم بعضا. يحب احدكم ان ياكل لحم اخيه ميتا فكرهتموه واتوا الله ان الله تواب رحيم (الحجرات: ١٢)

٥. يا ايها الذين اتاخفناكم من ذكر وانثى وجعلناكم شعوبا وقبائل لتعارفوا ان اكرمكم عند الله اتقاكم ان الله عليهم خير (الحجرات: ١٣)

#### احاديث

عن ابي هريرة ان رسول الله ﷺ قال: ان المفلس من امتي من ياتي يوم القيامة بصلاة و صيام و زكوة، وياتي قد شتم هذا، و هذا، و اكل مال هذا، و سفك دم هذا، و ضرب هذا، فيعطى هذا من حسناته، و هذا من حسناته، و هذا من حسناته، فان فيت حسناته ان يقضى ما عليه اخذ من خطاياهم فطرحت عليه ثم طرح في النار

#### ٤ دعوت واقامت دين

١. ومن اظلم ممن افترى على الله الكذب وهو يدعى الى الاسلام والله لا يهدي القوم الظالمين. (الصف: ٦١)

٢. يريدون ليطفنوا نور الله بافواههم، والله متم نوره ولو كره الكافرون. (الصف: ٦٢)

٣. هو الذي ارسل رسوله بالهدى ودين الحق ليظهره على الدين كله ولو كره المشركون. (الصف: ٦٣)

#### احاديث

١. عن ابي سعيد بن الخدري عن رسول الله ﷺ قال من رأى منكم منكراً فليغيره بيده فان لم يستطع فليسانه فان لم يستطع فليقلبه ذلك اضعف الايمان (مسلم)

٢. عن عبد الله بن عمر قال قال رسول الله ﷺ الا كلكم راع و كلكم مسؤول عن رعيته فالامام الذي على الناس راع وهو مسؤول رعيته والرجل راع على اهل بيته وهو مسؤول عن رعيته والمرأة راعية على بيت زوجها وولده وهي مسؤلة عنهم وعبد الرجل راع على

٢. يا ايها الذين امنوا لا ترفعوا اصواتكم فوق صوت النبي ولا تجهروا له بالقول كجهر بعضكم لبعض ان تحبط اعمالكم وانتم لا تعلمون. (الحجرات: ٢)

٣. ان الذين يغضون اصواتهم عند رسول الله اولئك الذين امتحن الله قلوبهم للتقوى لهم مغفرة واجر عظيم. (الحجرات: ٣)

٤. ولو انهم صبروا حتى تخرج اليهم لكان خيرا لهم والله غفور رحيم. (الحجرات: ٤)

٥. ان الذين ينادونك من وراء الحجرات اكثرهم لا يعقلون. (الحجرات: ٥)

٦. يا ايها الذين امنوا ان جاءكم فاسق بنبأ فتبينوا ان تصيبوا قوما بجهالة فتصبحوا على ما فعلتم نادمين. (الحجرات: ٦)

٧. واعلموا ان فيكم رسول الله لو يطيعكم في كثير من الامر لعنتكم ولكن الله حبب اليكم الايمان وزينه في قلوبكم وكره اليكم الكفر والفسوق والعصيان اولئك هم الراشدون. (الحجرات: ٧)

٨. فضلا من الله ونعمة والله عليم حكيم. (الحجرات: ٨)

٩. النبي اولى بالمؤمنين من انفسهم وازواجه امهاتهم واولوالارحام بعضهم اولى ببعض في كتاب الله من المؤمنين المهاجرين تفعلوا الى اولياءكم معروفاء كان ذلك في الكتاب مسطورا. (الاحزاب: ٦)

١٠. ان الله وملائكته يصلون على النبي يا ايها الذين امنوا صلوا عليه وسلموا تسليما. (الاحزاب: ٥٦)

١١. ان الذين يؤذون الله ورسوله لعنهم الله في الدنيا والاخرة واعد لهم عذابا مهينا. (الاحزاب: ٥٧)

١٢. لقد كان لكم في رسول الله اسوة حسنة لمن كان يرجو الله واليوم الآخر وذكر الله كثيرا. (الاحزاب: ٢١)

١٣. ما كان محمد اباً احد من رجالكم ولكن رسول الله وخاتم النبيين وكان الله بكل شيء عليما. (الاحزاب: ٤٠)

### احاديث

عن العباس بن عبد المطلب قال: قال رسول الله ﷺ ذاق طعم الايمان من رضى بالله ربا وبالاسلام ديناً وبمحمد رسولا

### آخرة

### آيات

١. يا ايها الذين امنوا اتقوا الله ولتنظر نفس ما قدمت لغد واتقوا الله ان الله خبير بما تعملون. (الحشر: ١٨)

٢. ولا تكثرنوا كالذين نسوا الله فانسهم انفسهم اولئك هم الفاسقون (الحشر: ١٩)

### حديث

عن ابن مسعود عن النبي ﷺ لا تزول قدما ابن آدم حتى يسئل عن خمس عن عمره فيما افناه وعن شبابه فيما ابلاح وعن ماله من اير اكتسبه وفيما انفقته وما ذا عمل فيم علم (جامع ترمذي)

### عبادات (نماز، زكاة، روزه، حج، جهاد)

١. قد افلح المؤمنون الذين هم في صلاتهم خاشعون. (المؤمنون: ١)

٢. والذين هم للزكاة فاعون. (المؤمنون: ٣)

٣. يا ايها الذين امنوا هل ادلكم على تجارة تنجيكم من عذاب اليم. (الصف: ١٠)

٤. تؤمنون بالله ورسوله وتجاهدون في سبيل الله باموالكم وانفسكم ذلكم خير لكم ان كنتم تعلمون. (الصف: ١١)

٥. يغفر لكم ذنوبكم ويدخلكم جنات تجري من تحتها الانهر ومساكن طيبة في جنت عدن ذلك الفوز العظيم. (الصف: ١٢)

مال سیدو، وهو مسؤول عنه إلا فكلکم راع و کلکم مسؤول عن رعیتہ (متفق علیہ)

۳. قال رسول الله ﷺ بجاء الرجل يوم القيامة فيلقى في النار فتندلق اقتتابه في النار فيطحن فيها كطحن الحمار برحاه فيجتمع له النار عليه فيقولون، اى اعلان ماشانك، اليس كنت تأمرنا بالمعروف وتنهانا عن المنكر؟ قال كنت امركم ولا اتنه ونهاكم عن المنكر واتيہ

احاديث

۱. عن عبد الله قال: قال رسول الله ﷺ طلب كسب الحلال فريضة بعد الفريضة (بيهقي: شعب الايمان)
۲. عن ابي سعيد قال: قال رسول الله ﷺ التاجر الصدوق الامين مع البين والصديق والشهداء (جامع ترمذی)

### باب دوم: مطالعہ سیرت (Seerah Study)

۱. مطالعہ سیرت کی اہمیت
۲. تزکیہ نفس اور تعمیر شخصیت کا نبوی منہاج
۳. تشکیلی معاشرت اور اسوۂ حسنہ
۴. ہجرت مدینہ، مواخات اور یناقت 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، دیانتیاتی علوم اور معاشرتی علوم میں مسلمانوں کا کردار
۶. برکاتہ بین المذاہب

پرچہ میں نمبروں کی تقسیم درج ذیل ہوگی

- قرآن وحدیث موضوعاتی مطالعہ : ۶۰  
مطالعہ سیرت : ۲۰  
مطالعہ تہذیب و تمدن : ۲۰

چند منوع  
شعبہ علوم اسلامیہ  
پروفیسر انور سیرگودھا

## SS-2312 - Pakistan Studies

## Course Outline for Pakistan Studies

Also, this course of Two Credit Hours for Under-Graduate Studies and BA/B.Sc course of 40 marks as compulsory course.

Objectives: 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. Quid-e-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. Unemployment Problem.
- 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)

## Recommended 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

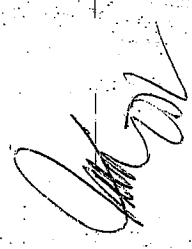
- Communication In The Nervous System
- Organization Of The Nervous System
- The Brain And The Behavior

#### 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
- vii. Observational Learning

## Intelligence

- What is intelligence, Artificial Intelligence
- Variation in intellectual abilities,
- 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

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

### Social Psychology

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

### Recommended Books:

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

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

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