UNIVERSITY OF SARGODHA
Office of the Registrar (Acad Branch)

No. SU/Acad/24102
Dated: 02.01.2024

Assistant Controller of Examinations (P.S),
Office of Controller of Examinations
University of Sargodha

Subject: **PROVISION OF SYLLABUS OF BS-IT, BS-SE AND BS-CS SESSION 2023-2027**

Kindly refer to your office Letter No.SU/CE/ACE (Secrecy-P.S)/01 dated 01.01.2024 on the subject captioned above.

2. It is to inform you that no revision in Syllabus of BS-IT, BS-SE and BS-CS program has been made by the department concerned in light of Undergraduate Education Policy (UEP-2023). After revision and approval from the relevant bodies, the same will be communicated to your good office.

Hussain 02/01/2024

Syed Abid Hussain
Assistant Registrar (Acad)
for registrar

Revised
Curriculum
of
BSInformation Technology
for
MainCampus,SubCampuses, and
AffiliatedColleges

DepartmentofComputer Science&Information Technology

Universityof Sargodha

(ApplicablefromFall2019)

TableofContents

GuidelinesforAffiliatedColleges

- BSITprogramshallbeofferedunderTermSystemobservingUniversityofSargo- dha's Affiliation Rules & Regulation.
- Thereshall be two termsinacalendaracademicyear.
- The affiliated college(s)/institutions shall follow the prescribed curriculum and course matrix. Necessary modification/changes shall be communicated to the affiliated Colleges/Institutions, if any.
- Fordomainelective courses,theaffiliatedinstitution(s)/college(s)shallfollow ―RegularTrack‖.However,theadministrationofanyaffiliatedinstitutionmustget prior permission from the competent authority to offer any specialization tracks/coursesapprovedbytheBOS. Forthis purpose,theinstitution'sadministra- tion 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/course shall be offered. The recommendations of the Convener BOS shall be solicited to allow the Institution to offer the requested specialization track/course already approved by the BOS.

TheDisciplineofInformationTechnology

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–ComputerScience(CS),ComputerEngineering(CE),andInformationSystems (ISs).By1990s,theglobalcommunityrealizedthatthefieldofcomputinghadgrownin many dimensions. Different academic institutions started offering different degree programs in Software Engineering (SE).

Theinventionsof personalcomputers revolutionizedtheconventionalconceptsof calculation and changed the way data was stored, retrieved and controlled. Computers became essential toolsateverylevelandnetworkedcomputersystemsbecametheinformationbackboneof organizations(Kotkin,2000).Italsoexpeditedthepaceofinventions(Thomson,2007) resulting manyinnovations in communication and computation technologies which brought a paradigm shift in the business world - from data processing to information processing; convertingindustrialsocietyintoaninformationsociety(Cohen,2009).Whilethisparadigm shiftimprovedproductivity, italsobroughtnewchallengesregarding thedevelopment, operation,maintenance,andup-gradationoforganizationalinformationmanagementinfrastructure (Samuelson, 1995).

Bythe end of 1990s, the academia realized that the existingcomputingdegree programs were not producing graduates who had the right mix of knowledge and skills to meetorganizational 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 technologyis a label that hastwomeanings.Inthebroadestsense,theterminformationtechnologyisoftenusedto 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 otherkindsoforganizations‖.Curriculum Guidelines for Undergraduate Degree Programs in InformationTechnology(2008)explains that―InformationTechnology(IT)inits broadest sense encompasses all aspects ofcomputingtechnology.IT,asan academicdiscipline,isconcernedwith issuesrelatedtoadvocatingforusers andmeetingtheirneedswithinan organizational and societal context through the selection, creation, application, integrationand administration of computing technologies.‖ Figure 1[1], depicts the key pillars of academic discipline of Information Technology

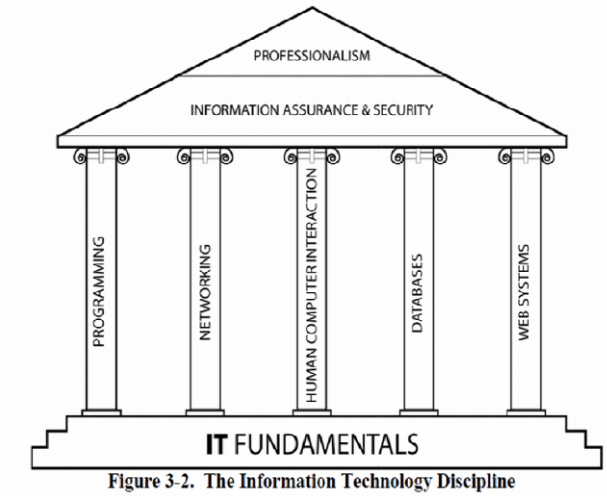


Figure 3-2. The Information Technology Discipline

[1]CurriculumGuidelinesforUndergraduateDegreeProgramsinInformationTechnology(2008)

Information Technology as an academic discipline, as defined by The Information TechnologyAssociationofAmerica(ITAA),is—thestudy,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 andcomputersoftwareto securelyconvert,store,protect,process, transmit,input,output,and retrieve information.[Wikipedia]

VisionofInformationTechnologyEducation

Asdefinedincc2008—InformationTechnologyisverymuchanintegrativediscipline;itpulls 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 theuseof appropriate tools.‖ In thelight ofthisexplanation, 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 communicateeffectively 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;
- todevelop students‘ capacityfor innovation and passion for lifelonglearning.

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 immediateneeds 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 1st 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.

InformationTechnologyPrograms'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 properlyand professionals who make these systemssecured,upgraded,andmaintained. Inparallel,employeesrequire supportfromthese professionals to make technology effective for enhancing organizational productivity. This has created a huge demand of IT professionals both locally and globally. Meetingthis 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 technologybodyof knowledge through academics, applications and researchwhich positivelyimpact 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.

UnderlyingPrinciplesofInformationTechnologyPrograms

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 identityofthestudentcommunity.Tomeetthesechallenges, the Department has revised the existing curriculum. The revised curriculum is based on following underlying principles:

i. Thecurriculum shouldbeabroadbased andprovidesstudentswiththeflexibilityto work across many disciplines & professions.
ii. Thecurriculumshould preparegraduates tosucceedinarapidlychangingfield.
iii. Thecurriculum shouldprovideguidancefortheexpectedlevelofmasteryoftopics by graduates.
iv. Should provide realistic, adoptable recommendations that provide guidance and flexibility,allowingcurriculardesignsthatareinnovativeandtrackrecentdevelopmentsin the field.
v. Thecurriculumcontentsshouldberelevantandcompatible withavarietyof institu-

tions.

vi. The sizeof theessential knowledgemust bemanaged.
vii. Thecurriculumshouldidentifythefundamentalskillsandknowledgethatallgradu- ates should possess.
viii. Thecurriculum shouldprovidethegreatestflexibilityin organizingtopicsinto 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 boundariesoffundamentalknowledgeoftraditionaldisciplinesto advancedknowledgeofthe 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:Theoreticallearningofconceptsandprinciplesregardingaparticular subject(s).
ii. Skills:Capabilityof usinglearnt knowledgeand applyingitaccordingto thecontext
iii. Competencies:Theabilitytodothingssatisfactory-notnecessarilyoutstandinglyor even well, but rather to a minimum level of acceptable performance.
iv. Expertise:Levelofproficiencyandinnovativewaysofapplyinglearntknowledge. (Competitive edge)
v. Dispositions: Habits of mind or tendencies to respond to certain situations in certain ways.Theroleofdispositionsincomputingeducationisveryimportant.Forexample, having the disposition to be a programmer is much better that just having program- ming skills.
vi. Values:Moral,ethicalandprofessional practices.

To strengthen the curriculum further, specialization tracks/courses have also been integrated within the curriculum‘s BOK. These specialization tracks/courses 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
BSInformationTechnologyProgram Details

of BS Information Technology

Program'sAims&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:

- Applyknowledge ofcomputingandmathematics appropriatetothediscipline.
- Analyzeaproblem,andidentifyanddefinethecomputingrequirements appropriate to its solution.
- Design,implement,andevaluateacomputer-basedsystem,process,component, or program to meet desired needs.
- Functioneffectivelyon teams toaccomplisha commongoal.
- Understandtheprofessional,ethical,legal,securityandsocialissuesand responsibilities.
- Communicate effectivelywitharangeofaudiences.
- Analyzethelocalandglobalimpactofcomputingonindividuals,organizations, and society.
- Recognizetheneedforandanabilitytoengagein continuingprofessional development.
- Usethecurrent techniques,skills, and toolsnecessaryfor computingpractice.
- Useandapplythelatesttechnicalconcepts andpracticesinthecoreinformation technologies.
- Identifyandanalyzeuserneedsandtakethemintoaccountintheselection, creation, evaluation and administration of computer-based systems.
- IntegrateIT-basedsolutionsintotheuserenvironment.
- Understandthebestpracticesandstandardsandtheirapplication.
- Assistinthe creationofan effectiveprojectplan.

Program'sOutcome

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 acceptablevalues to take on appropriate professional roles in information technologydomain or proceed to further or higher education or training.

Program'sStructure

The structureof BSIT program is verydynamic and providesbasis for various options including Breadth-Based, Depth-Based, and Integrated Breadth & Depth-Based specializations. Student maychoose aparticular option, which is the most appropriateto their planned future career. Followings are the program's details:

SpecializationTracks

Followingspecializationtracks arebeingoffered:

1. RegularTrack[Public-Privatecampusesandaffiliatedcollegeswillfollow track]
2. GeneralTrack[Mainandpublicsub campuses]

Degree Requirement

Tobecome eligible forawardofBSdegree, astudent must satisfythe following requirements:

a) Must have studied and passed theprescribed courses, totalingat least 130 credithours.
b) MusthaveearnedCGPA(CumulativeGradePointAverage)ofatleast2.0onascale of 4.0.

Duration

TheminimumdurationforcompletionofBSdegreeisfour years.AccordingtoHEC maximum period of seven years is to complete BS degree requirements.

Eligibility Criteria

The minimum requirements for admission in a Bachelor degree program in InformationTechnology, is**atleast50% marksin Intermediate(HSSC)examination with Mathematics or equivalent qualification with Mathematics certified by IBCC**.

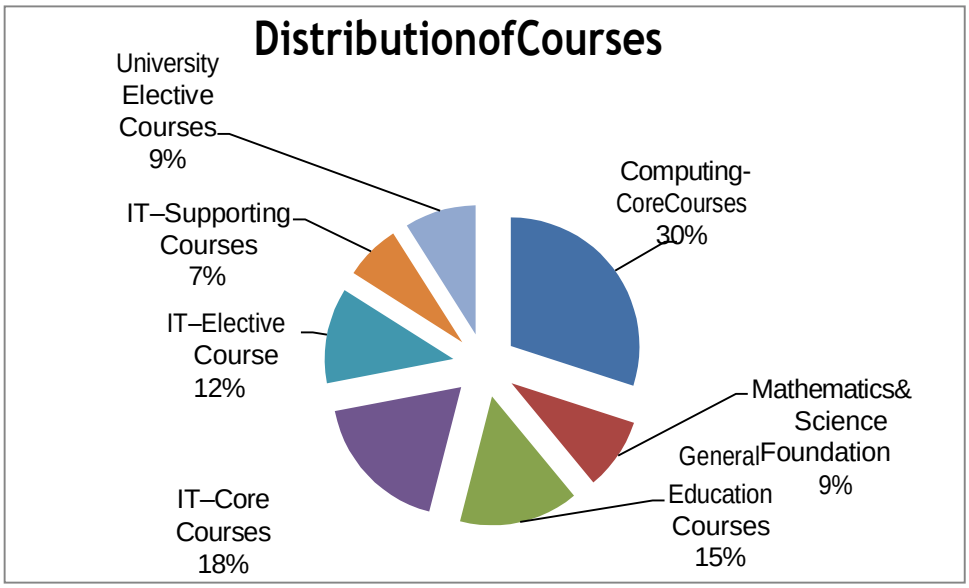
Assessment&Evaluation

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

DistributionofCourses

Followingsarethedistributionoftotalcredithours:

DistributionofCourses		
MajorAreas	**Credit Hours**	%
ComputingFoundation Core Courses	39	30%
Mathematics&Science Foundation	12	9%
GeneralEducation Courses	19	15%
IT–CoreCourses	24	18%
IT–ElectiveCourse	15	12%
IT–SupportingCourses	09	7%
UniversityElectiveCourses	12	9%
Total	**130**	**100%**



CourseCodingScheme

Discipline Code	Course Level	CourseNumber
4Letters	1 Digit	2 Digits
XXXX	0-9	00-99

Discipline Code	
CMPC	ComputingCoreFoundation
ITCC	InformationTechnologyCore
ITSCC	InformationTechnologySupporting
ITEC	InformationTechnologyElective
PKST	Social Studies
MATH	Mathematics
ENGL	English
MNG	Management
ICTC	Information&Communication Technologies
PHYS	Physics

CourseLevel	
Level	**CourseType**
1	Foundation,CoreLevel1Courses
2	Foundation,CoreLevel1Courses
3	Core Level2+Specialization Level1
4	SpecializationLevel2

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SchemeofStudyforBS(InformationTechnology)

For Public-PrivateSubCampusesandAffiliatedCollages

4-YearProgram(8RegularSemesters)

Semester-I

Code	CourseTitle	Credit Hours	Pre-requisite
ICTC-101	IntroductiontoICT	2-1	
CMPC-101	ProgrammingFundamentals	3-1	
ENGL-101	EnglishComposition&Comprehension	3-0	
MATH-101	Calculus&AnalyticalGeometry	3-0	
PHYS-101	AppliedPhysics/QuantumComputing	3-0	
	Total	14-2	

Semester-II

Code	CourseTitle	CreditHours	Pre-requisite
CMPC-102	ObjectOrientedProgramming	3-1	ProgrammingFundamentals
ENGL-102	Communication&PresentationSkills	3-0	
ITSC-102	DigitalLogic Design	3-0	
MATH-102	Probability&Statistics	3-0	
BUSB-102	Business Economics	3-0	
BUSB-202	PrinciplesofManagement	3-0	
	Total	18-1	

Semester-III

Code	CourseTitle	Credit Hours	Pre-requisite
CMPC-203	DataStructures&Algorithms	3-1	Object-OrientedProgramming
CMPC-205	Discrete Structures	3-0	
ITSCC-201	ProfessionalPractices	3-0	
ITSC-201	EnterpriseSystems	3-0	
MATH-203	Linear Algebra	3-0	
	Total	15-1	

Semester-IV

Code	CourseTitle	Credit Hours	Pre-requisite
CMPC-204	Operating Systems	3-1	DataStructures&Algorithms
CMPC-206	SoftwareEngineering	3-0	
CMPC-208	ComputerNetworks	3-1	
ITCC-202	ITProjectManagement	3-0	
BUSB-202	Entrepreneurship	3-0	
	Total	15-2	

Semester- V

Code	CourseTitle	Credit Hours	Pre-requisite
CMPC-301	Database Systems	3-1	DataStructures&Algorithms
CMPC-303	Information Security	3-0	
ITSC-305	Design andAnalysisofAlgorithms	3-0	
ITCC-301	SystemandNetworkAdministration	3-1	OperatingSystems
ITEC-303	MobileApplicationDevelopment	3-0	
	Total	15-2	

Semester- VI

Code	CourseTitle	Credit Hours	Pre-requisite
ITCC-302	WebTechnologies	3-0	
BUSB-302	HumanResourcesManagement	3-0	
ITEC-302	Cloud computing	3-0	
ITEC-304	NetworkDesignand Management	3-0	
ENGL-302	Technical&BusinessWriting	3-0	
	Total	15-0	

Semester- VII

Code	CourseTitle	Credit Hours	Pre-requisite
ITCC-403	VirtualSystemsandServices	3-1	
CMPC-401	FinalYearProject–I	0-3	
ITCC-407	ITInfrastructure	3-0	
ITEC-405	MobileandWirelessNetworks	3-0	
PKST-401	PakistanStudies	2-0	
	Total	11-4	

Semester- VIII

Code	CourseTitle	Credit Hours	Pre-requisite
CMPC-402	FinalYearProject–II	0-3	
ITCC-402	CyberSecurity	3-0	
ITEC-420	DataWarehousing	3-0	
ITCC-406	Database Administration and Management	3-1	
ISLS-402	IslamicStudies/Ethics	2-0	
	Total	11-4	

ComputingCoreCourses–39CreditHours				
#	**Code**	**Pre-Req**	**CourseTitle**	**Cr.Hrs.**
1	CMPC-101	-	Programming Fundamentals	4 (3+1)
2	CMPC-102	CMPC-101	ObjectOrientedProgramming	4 (3+1)

3	CMPC-205	-	DiscreteStructures	3 (3+0)
4	CMPC-203	CMPC-102	DataStructureandAlgorithms	3 (3+1)
5	CMPC-204	-	OperatingSystems	4 (3+1)
6	CMPC-206	-	SoftwareEngineering	3 (3+0)
7	CMPC-208	-	Computer Networks	3 (3+1)
8	CMPC-301	-	DatabaseSystems	4 (3+1)
9	CMPC-303	-	InformationSecurity	3 (3+0)
10	CMPC-401	-	Capstone Project	6 (0+6)

MathematicsandScienceFoundationCourses-12CreditHours				
#	**Code**	**Pre-Req**	**CourseTitle**	**Cr.Hrs.**
11	MATH-101	-	CalculusandAnalyticalGeometry	3 (3+0)
12	MATH-102	-	ProbabilityandStatistics	3 (3+0)
13	MATH-203	-	Linear Algebra	3 (3+0)
14	PHYS-101	-	Applied Physics	3 (3+0)

GeneralEducation Courses– 19Credit Hours				
#	**Code**	**Pre-Req**	**CourseTitle**	**Cr.Hrs.**
15	ENGL-101	-	EnglishComposition&Compre-hension (English-I)	3 (3+0)
16	ENGL-102	ENGL-101	CommunicationandPresentation Skills(English-II)	3 (3+0)
17	ENGL-302	ENGL-102	TechnicalandBusinessWriting (English-III)	3 (3+0)
18	PKST-401	-	IslamicStudies	2 (2+0)
19	ISLS-402	-	PakistanStudies	2 (2+0)
20	ICTC-101	-	Introduction to Information &Communication Technologies	3 (2+1)
21	ITSCC-201	-	ProfessionalPractices	3 (3+0)

IT— CoreCourses(24CreditsHours)				
#	**Code**	**Pre-req**	**CourseName**	**Cr.Hrs.**
22	ITCC-402		CyberSecurity	3 (3+0)
23	ITCC-406		Database Administration &Management	4 (3+1)
24	ITCC-202		ITProjectManagement	3 (3+0)
25	ITCC-407		InformationTechnologyInfrastruc-ture	3(3+0)
26	ITCC-301		Systems and Network Administration	4 (3+1)
27	ITCC-403		VirtualSystemsand Services	4 (3+1)
28	ITCC-302		WebSystemsandTechnologies	3 (3+0)

IT—Supporting Courses(09Credits Hours-Any3 Courses)				
#	**Code**	**Pre-req**	**CourseName**	**Credithours**
29	ITSC-201	-	EnterpriseSystems	3 (3+0)
30	ITSC-301		OperationResearch	3 (3+0)
31	ITSC-302	-	ObjectOriented Analysis & Design	3 (3+0)
32	ITSC-303	-	OptimizationTechniques	3 (3+0)
33	ITSC-102	-	DigitalLogicDesign	3 (3+0)
34	ITSC-305	-	Design andAnalysisofAlgorithm	3 (3+0)

UniversityElectivesCourses(12 Credits Hours)				
#	**Code**	**Pre-req**	**CourseName**	**Cr.Hrs.**
35	BUSB-102	-	Business Economics	3 (3+0)
36	BUSB-302	-	Human Resource Management	3 (3+0)
37	BUSB-202	-	Principles of Management	3 (3+0)
38	BUSB-204	-	Entrepreneurship	3 (3+0)

InformationTechnologyElectiveCourses

RegularTrackITElectiveCourses(15 CreditHours- Any 5 Courses)				
39	ITEC-303	-	MobileApplicationDevelopment	3(3+0)
40	ITEC-405	-	MobileandWireless Networks	3(3+0)
41	ITEC-302	-	Cloud Computing	3(3+0)
42	ITEC-404	-	InternetofEveryThing	3(3+0)
43	ITEC-420	-	DataWarehousing	3(3+0)
44	ITEC-407	-	KnowledgeManagement	3(3+0)
45	ITEC-304	-	NetworkDesignand Management	3 (3+0)
46	ITEC-409	-	BusinessIntelligenceandAnalytics	3(3+0)

GeneralTrackITElectiveCourses (15 CreditHours- Any 5 Courses)				
47	ITEC-303	-	MobileApplicationDevelopment	3(3+0)
48	ITEC-401	-	E-CommerceApplicationsDevelop-ment	3(3+0)
49	ITEC-405	-	MobileandWirelessNetworks	3(3+0)
50	ITEC-302	-	Cloud Computing	3(3+0)
51	ITEC-404	-	InternetofEveryThing	3(3+0)
52	ITEC-420	-	DataWarehousing	3(3+0)
53	ITEC-406	-	SemanticWeb	3(3+0)
54	ITEC-407	-	KnowledgeManagement	3(3+0)

55	ITEC-304	-	NetworkDesign and Management	3(3+0)
56	ITEC-409	-	BusinessIntelligenceandAnalytics	3(3+0)
57	ITEC-410	-	Data Mining	3(3+0)
58	ITEC-411	-	EnterpriseResourcePlanning	3(3+0)
59	ITEC-412	-	Network Programming	3(3+0)
60	ITEC-413	-	InformationSystemsand Audit	3(3+0)
61	ITEC-414	-	Routingand Switching	3(3+0)
62	ITEC-415	-	BusinessProcess Management	3(3+0)
63	ITEC-416	-	ArtificialIntelligence	3(3+0)

CourseContentsforBSInformationTechnology

ContentsofComputingCoreCourses

CMPC-101ProgrammingFundamentals			
CreditHours:	4(3,1)	**Prerequisites:**	

CourseLearningOutcomes (CLOs):		
Attheend ofthecourse thestudentswillbeable to:	**Domain**	**BT Level***
1. Problemsolving skills	C	1
2.Coding skills	C	2
*BT=Bloom'sTaxonomy,C=Cognitivedomain,P=Psychomotordomain,A=Affective domain		

CourseContent:

1. Introduction, Introduction to Computer Programming: Machine Languages, Assembly Languages and High-Level Languages. History of C, C Standard Library, Typical C Program Development Environment, Memory Concepts, white spaces, comments. [Ch. 1]
2. Principles of Structured and Modular Programming: Algorithms, Pseudo code, flowchart representation. Basic Data Types (variables, constants). [Ch. 2]
3. Unary (increment/decrement) and Binary (arithmetic, relational, arithmetic assignment) operators. Arithmetic (Expression) in C. C Programming Basics: Programming Practices, Summary. [Ch. 1, 2, 3]
4. Decision Statements: if statement, if-else statement, Multi if-else-if statement. Decision Statements: Nested if-else statements, Switch Statement. [Ch. 3]
5. Decision Statements: Conditional operator, Logical Operators, Programming Practices,and Summary. Program Control: Repetition Essentials, Counter-Controlled Repetition. for loop. [Ch. 3]
6. Loops:whileloop, do while loop [Ch.4]
7. Nested loop structures. Other Control Statements, break and continue Statements, Logical Operators, Confusing Equality (==) and Assignment (=) Operators. Programming Practices, Summary. [Ch. 4]
8. Arrays: Defining Arrays, Array Examples (finding max, min value from the array). Searching techniques (linear search, Binary search). Sorting Arrays: selection sort, bubble sort. Case Study: Computing Mean, Median and Mode Using Arrays. [Ch. 6]
9. Strings: String Library Functions Characters and Strings: Fundamentals of Strings and Characters. Strings: Character-Handling Library, Programming Practices, Summary. [Ch. 8]
10. Functions:Functiondeclaration,definition,PassingArgumentstofunctions,Returning values from functions. Functions: Arguments pass by reference and pass by copy. [Ch.8]
11. Functions: Passing arrays and strings to functions. Functions: Inline functions, Default arguments, Local and global variables, Summary. [Ch. 8]
12. Pointers:Pointersandtheirpurpose.Pointerexpressions.Pointers:Pointersandarrays, Pointers in functions. [Ch. 8]

13. Pointers: Static and dynamic memory allocation, Memory Management using Pointers. Problems with pointers, program practice, Summary.[Ch. 8]
14. Structures: Purpose, Defining structures, Initializing Structures, Accessing Structure Members. Example (complex number or Time). Structures: Passing Structures to functions, Structures using pointers. [Ch.10]
15. File Processing: Data Hierarchy, Files and Streams, Creating a Sequential-Access File, Reading Data from a Sequential-Access File. File Processing: Random-Access Files, Creating a Random-Access File, Writing Data Randomly to a Random-Access File, Reading Data from a Random-Access File. [Ch.10]

TeachingMethodology:

Lectures,WrittenAssignments,SemesterProject,LabAssignments,Presentations

CourseAssessment:

SessionalExam,HomeAssignments,Quizzes,Project,Presentations,FinalExam

ReferenceMaterials:

1. CHowtoProgrambyPaul DeitelandHarveyDeitel,PrenticeHall;7th Edition(March 4, 2012)
2. ProgramminginCbyStephenG.Kochan,Addison-WesleyProfessional;4edition(September 25, 2013). ISBN-10: 0321776410

CMPC-102ObjectOriented Programming			
CreditHours:	4(3,1)	**Prerequisites:**	Programming Fundamentals

CourseLearningOutcomes (CLOs):		
Attheend ofthecourse thestudentswillbeable to:	**Domain**	**BT Level***
1.**Describe** thekeyterminologies ofobjectoriented programming	C	2
2.**Explain**the Classesand objects paradigm	C	3
3.**Identify** various programmingtechniques in object oriented.	C	3

*BT=Bloom‘sTaxonomy,C=Cognitivedomain,P=Psychomotordomain,A=Affective domain

CourseContent:

1- ObjectsandClasses, Abstraction,Encapsulation[TB1:Ch9-11]
2- FinalClasses,NestedandInnerClasses.[TB2:Ch. 5]
3- Inheritance,AbstractClasses,ConcreteClasses, InheritanceandEncapsulation.[TB1:Ch12]
4- Theis-aRelationship,InheritanceviaAbstractClasses,ExtendingtheHierarchy,Upcasting and Down casting, Interfaces.[TB1: Ch12]
5- Composition,the has-aRelationship.[TB1: Ch12]
6- Polymorphism.[TB1:Ch13]
7- Polymorphism,Dynamic(or Late)Binding.[TB1:Ch13]
8- InterfacesandPolymorphism.[TB1: Ch13]
9- TheWrapperClasses,BoxingandUn-Boxing,Packages.[TB1:Ch14, Ch9.4]
10- ExceptionsandExceptionHandling.[TB2:Ch7]
11- File Systems and Paths, File and Directory Handling and Manipulation, Input/output Streams,ReadingBinaryData,WritingbinaryData,WritingText(Characters),Reading

Text(Characters),LoggingwithPrintStream,RandomAccessFiles,ObjectSerialization. [TB1: Ch. 15]
12- Collections,for-each Loop.[TB1:Ch16,17]
13- GUIConcepts,ComponentsandContainers,AbstractWindowsToolkitandSwing,Win- dows and Frames, Layout Managers, Panels.[TB1: Ch. 18]
14- Event-DrivenProgramming,ThedelegationEventModel.[TB1:Ch 19]
15- EventClasses, Mouse Events, KeyboardEvents,UsingActions.[TB1:Ch19]
16- ComponentandJComponent,Buttons,Labels,TextFields,TextAreas,DialogBoxes, Checkboxes and Radio Buttons, Menus, J-Slider, J-Tabbed Pane.[TB1: Ch. 19]

TeachingMethodology:

Lectures,WrittenAssignments,Practicallabs,SemesterProject,Presentations

CourseAssessment:

SessionalExam,HomeAssignments,Quizzes,Project,Presentations,FinalExam

ReferenceMaterials:

1- JavaProgramming:FromtheGroundUpbyRalphBravacoandShaiSimonson,McGraw- Hill Higher Education New York, 2010, ISBN 978–0–07–352335–4
2- IvorHorton's BeginningJavabyIvor Horton,JohnWiley&Sons,Inc,7thEdition, 2011, ISBN: 978-0-470-40414-0

CMPC-205DiscreteStructures			
CreditHours:	3(3,0)	**Prerequisites:**	None

CourseLearningOutcomes (CLOs):		
Attheend ofthecourse thestudentswillbeable to:	**Domain**	**BT Level***
1- The course provides a solid theoretical foundation of discrete structuresastheyapplytocomputerscienceproblemsandstruc- tures.	C	2
2- Thestudentswilllearnhowtousemathematicalnotationand solve problems using mathematical tools.	C	3
*BT=Bloom‘sTaxonomy,C=Cognitivedomain,P=Psychomotordomain,A=Affective domain		

CourseContent:

1. Logic:PropositionalEquivalences,PredicatesandQuantifiers,NestedQuantifiers,Meth- ods of Proof. [TB: Ch. 1]
2. Sets&Functions, Sequences andSummations. [TB: Ch. 2]
3. Algorithms:theGrowthofFunctions,ComplexityofAlgorithms,theIntegersandDivi- sion, Matrices. [TB: Ch. 3]
4. NumberTheoryand Cryptography.[TB: Ch. 4]
5. Advanced Counting Techniques: Recurrence Relations, Solving Recurrence Relations, Divide-and-Conquer Algorithms and Recurrence Relations, Generating Functions, Inclu- sion-Exclusion & its Application. [TB: Ch. 8]
6. RelationsandTheir Properties,n-aryRelationsand TheirApplications,RepresentingRe-

lations,ClosuresofRelations,EquivalenceRelations,PartialOrderings. [TB:Ch. 9]
7. Graph:RepresentingGraphsandGraphIsomorphism,Connectivity,EulerandHamilton Paths, Shortest-Path Problems, Planar Graphs, Graph Coloring. [TB: Ch. 10]
8. Trees:ApplicationsofTrees,TreeTraversal,SpanningTrees,MinimumSpanningTrees. [TB: Ch. 11]

TeachingMethodology:

Lectures,Class Exercises

CourseAssessment:

SessionalExam,HomeAssignments,Quizzes,FinalExam

ReferenceMaterials:

1. K.H.Rosen,DiscreteMathematicsandItsApplications,McGraw-HillScience/Engineering/Math, 7th Ed. 2011. ISBN-10: 0073383090[TB]
2. R.Johnsonbaugh,DiscreteMathematics,Pearson; 7thEd.,2008.ISBN-10:0131593188
3. S.B.MaurerandA.Ralston,DiscreteAlgorithmicMathematics,AKPeters/CRC Press; 3rd Ed., 2004. ISBN-10: 1568811667
4. B.Kolman,R.BusbyandS.C.Ross,DiscreteMathematicalStructures,Pearson,6th Ed. 2008. ISBN-10: 0132297515

CMPC-203DataStructureandAlgorithms			
CreditHours:	4(3,1)	**Prerequisites:**	ObjectOrientedProgramming

CourseLearningOutcomes (CLOs):		
Attheend ofthecourse thestudentswillbeable to:	**Domain**	**BTLevel***
1. Learn the theory, practice and methods of data structures and algorithm design.	C	2
2. Learn and practice elementary data structures such as stacks, queues, linked lists, sequences, trees and graphs and the algorithmsdesigned formanipulatingthese datastructures.	C	3

*BT=Bloom‘sTaxonomy,C=Cognitivedomain,P=Psychomotordomain,A=Affective domain

CourseContent:

1. IntroductiontoDataStructure,primitivejava,ReferenceTypes,AlgorithmAnalysis.[TB1:Ch1, 2, 5]
2. Javacollections API(The JavaCollectionsFramework). [TB1:Ch6]
3. Recursion,SortingAlgorithms(BubbleSort,SelectionSort,InsertionSort,Shell Sort).[TB1: Ch 6, 7]
4. SortingAlgorithms(MergeSort,QuickSort,HeapSort,SpeedLimitforcomparisonSorts, Radix Sort, Bucket Sort), Randomization. [TB1: Ch 7, 8]
5. Stackand Queue. [TB1:Ch16, TB2:Ch6, 7]
6. Linked Lists.[TB1:Ch16]
7. Linked Lists.[TB1:Ch 16,TB2:Ch8]
8. HashTable.[TB1:Ch20]
9. Trees.[TB1:Ch18]
10. BinarySearchTrees,PriorityQueue: theBinaryHeap. [TB1: Ch 19, Ch21]

11. SplayTrees,MergingPriorityQueues. [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 Hamilto-nian 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]

TeachingMethodology:

Lecturing,WrittenAssignments,Project, Report Writing

CourseAssessment:

SessionalExam,HomeAssignments,Quizzes,Project,Presentations,FinalExam

ReferenceMaterials:

1. DataStructures&ProblemSolvingUsingJavabyMarkAllenWeiss,Addison-Wesley, 4thEdition (October 7, 2009). ISBN-10: 0321541405
2. Schaum'sOutlineofDataStructureswithJavabyJohnHubbard,McGraw-Hill; 2ndEdition (May 26, 2009). ASIN: B0035X1BQ6
3. DataStructures:AbstractionandDesignUsingJavabyKoffmanandWolfgang,Wiley; 2nd Edition (January 26, 2010). ISBN-10: 0470128704
4. DataStructuresandAlgorithmAnalysisinJavabyMarkAllenWeiss,PrenticeHall; 3rdEdition (November 28, 2011). ISBN-10: 0132576279

CMPC-204Operating Systems			
CreditHours:	4(3,1)	**Prerequisites:**	None

CourseLearningOutcomes (CLOs):		
Attheend ofthecourse thestudentswillbeable to:	**Domain**	**BT Level***
1-Describethegeneralunderstandingoftheprinciplesandconcepts governing the functions of operating systems	C	3
2-Explainthelayeredapproachthatmakesdesign,implementation and operation.	C	3
3-Identify aspectofcomplexoperatingsystem	C	3

*BT=Bloom‘sTaxonomy,C=Cognitivedomain,P=Psychomotordomain,A=Affective domain

CourseContent:

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, Inter process Communication, Communication in Client- Server Systems. Threads: Multithreading Models, Thread Libraries, Threading Issues. [TB: Ch. 3, 4]
4- CPU Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms, Multiple-Processor Scheduling, Thread Scheduling, Algorithm Evaluation. [TB: Ch. 5]
5- Process Synchronization: Background, Monitors, The Critical-Section Problem, Peterson'sSolution,SynchronizationHardware, Semaphores,ClassicProblems ofSynchronization. [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 MemoryAllocation, Paging, and Structure of the Page Table, Segmentation, and 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, KernelI/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- Casestudies:Linux,WindowsOperatingSystems.

TeachingMethodology:

Lectures,WrittenAssignments,Practicallabs,SemesterProject,Presentations

CourseAssessment:

SessionalExam,HomeAssignments,Quizzes,Project,Presentations,FinalExam

ReferenceMaterials:

1- OperatingSystemConceptsEssentialsbyAbrahamSilberschatz,PeterB.Galvinand Greg Agne, Wiley; 8th Edition (July 5, 2008). ISBN-10:0470128720
2- AppliedOperatingSystemsConceptsbySilberschatzA.,Peterson,J.L.,&Galvin P.C.Wiley; 8th Edition (2011). ISBN-10: 1118112733

CMPC-206SoftwareEngineering			
CreditHours:	3(3,0)	**Prerequisites:**	**None**

CourseLearningOutcomes (CLOs):		
Atthe endofthecourse thestudents willbeable to:	**Domain**	**BTLevel***
1:Explainshowvarioussoftwaredevelopmentmodelsandsoftware development life cycles are applied.	C	4
2:Presentsthefundamentalsconceptsofprojectmanagement. 3: Important Requirements modeling, fact-finding techniques 4: Have knowledge of software configuration management.	C	3
	C	3
*BT=Bloom‘sTaxonomy,C=Cognitivedomain,P=Psychomotordomain,A=Affective domain		

CourseContent:

1. The Nature of Software, Unique Nature of WebApps, Software Engineering, The Software Process, Software Engineering Practice, Software Myths. [TB1: Ch. 1]
2. Generic Process Models: Framework Activity, Task Set, Process Patterns, Process Improvement, CMM, Prescriptive Process Models: Waterfall Model, Incremental Process Model, Evolutionary Process Model. [TB1: Ch. 2]
3. Specialized Process Models: Component Based Development, The Formal Methods Models, Agile Development. [TB1: Ch. 2-3]
4. Introduction to Systems Analysis and Design, Business Information Systems, Information System Components, Types of Information Systems, Evaluating Software, Make or Buy Decision. [TB1: Ch. 1]
5. Introduction to SDLC, SDLC Phases, System Planning, Preliminary Investigation, SWOT Analysis. [TB1: Ch. 2]
6. The Importance of Strategic Planning, Information Systems Projects, Evaluation of Systems Requests, Preliminary Investigation, Systems Analysis, Requirements Modeling, Fact-Finding Techniques. [TB1: Ch. 2-3]
7. Requirements Engineering, Establishing the Groundwork, Eliciting Requirements, Developing Use Cases, Building the Requirements Model. [TB1: Ch. 5]
8. Requirements Modelling Strategies, Difference between Structured Analysis and Object Oriented Analysis; Difference between FDD Diagrams & UML Diagrams. [TB2:Ch. 3]
9. Data & Process Modelling, Diagrams: Data Flow, Context, Conventions, Detailed Level DFD_s Diagram 0, Levelling, Balancing, Logical Versus Physical Models. [TB2: Ch. 4]
10. Design Within the Context of Software Engineering, The Design Process, Design Concepts, Design Models: Data Design Elements. [TB1: Ch. 8]
11. Architecture Design Elements, Interface Design Elements, Component-Level Design Elements, Deployments Design Elements. [TB: Ch. 8]
12. System Architecture, Architectural Styles, User InterfaceDesign: 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:SoftwareMaintenance,SoftwareReengineering.[TB1:Ch.28-29]
TeachingMethodology:
Lecturing,WrittenAssignments,ReportWriting
CourseAssessment:
SessionalExam,Home Assignments,Quizzes, Presentations, FinalExam
ReferenceMaterials:
1. SoftwareEngineering:APractitioner'sApproachbyRogerS.Pressman,McGraw-Hill Science/Engineering/Math; 7th Edition (2009). ISBN-10: 0073375977 2. SoftwareEngineering8EbyIanSommerville,AddisonWesley;8thEdition(2006).ISBN- 10: 0321313798 3. SystemsAnalysisandDesignbyGaryB.Shelly, ThomasJ.CashmanandHarryJ.Rosen- blatt, Course Technology; 7th Edition (2007). ISBN-10: 1423912225 4. SystemsAnalysisandDesignbyGaryB.Shelly, ThomasJ.CashmanandHarryJ.Rosen- blatt, Course Technology; 7th Edition (2007). ISBN-10: 1423912225

CMPC-208Computer Networks			
CreditHours:	4(3,1)	**Prerequisites:**	None

CourseLearningOutcomes (CLOs):		
Attheend ofthecourse thestudentswillbeable to:	**Domain**	**BT Level***
1-Describethekeyterminologiesandtechnologiesofcomputernet- works	C	2
2-Explaintheservicesandfunctionsprovidedbyeachlayerinthe Internet protocol stack.	C	2
3-Identifyvariousinternetworkingdevicesandprotocols,andtheir functions in a network.	C	4
4-Analyzeworkingandperformanceofkeytechnologies,algorithms and protocols.	C	4
5-Build ComputerNetwork on various Topologies	P	3
*BT=Bloom‘sTaxonomy,C=Cognitivedomain,P=Psychomotordomain,A=Affective domain		

CourseContent:
1. Introductiontonetworksandprotocolsarchitecture[TB1:Ch.1]. 2. Basicconceptsofnetworking,networktopologiesandtheInternet[TB1:Ch. 1]. 3. LayeredarchitectureandtheOSImodel[TB1: Ch.2]. 4. Physicallayerfunctionality,datalinklayerfunctionalityandtheTCP/IPprotocolarchitec- ture [TB1: Ch. 2]. 5. Multipleaccesstechniques,WANTechnologiesandprotocols,circuitswitchingandpacket switching.[TB1: Ch. 9] 6. Wirelessnetworks,CellularNetworkGenerationsandLTE-Advanced[TB1: Ch.10] 7. LANtechnologies,LAN protocolarchitecture and virtual LANs[TB1:Ch.11] 8. MACaddressing.[TB1:Ch.11] 9. Networkingdevices ,bridges, hubsand switches[TB1:Ch. 11]

10. Networklayerprotocols, PrinciplesofInternetworking,IPv4and IPv6.[TB1: Ch.14]
11. IPaddressing,InternetProtocolOperation,virtualprivatenetworksandIPSecurityand Subnetting, CIDR. [TB1: Ch. 14].
12. Transportlayerprotocols,portsandsocketsandconnection-orientedtransportprotocol mechanisms [TB1: Ch. 15]
13. RoutingprotocolsOSPF,EIGRP,RIPandroutinginpacket-switchingnetworks[TB1:Ch. 19]
14. Connectionestablishment,flowandcongestioncontrol,effectsofcongestion,TCPconges- tion control and datagram congestion control protocol [TB1: Ch. 20]
15. Applicationlayerprotocols,electronicmail(SMTPandMIME),WebAccess:HTTPand DNS [TB1: Ch. 24]
16. Latesttrendsincomputer networks,real-timetrafficandvoiceoverIP[TB1:Ch.25]

Labs:

1- IntroductiontoNetworkingequipment.
2- NetworkingBasicscommands.
3- TCP/IPNetworksconfiguration.
4- CablingConstruction.
5- BuildingPeer-to-PeerNetwork.
6- Tools:Packettracer, Wireshark.

TeachingMethodology:

Lectures,WrittenAssignments,Practicallabs,SemesterProject,Presentations

CourseAssessment:

SessionalExam,HomeAssignments,Quizzes,Project,Presentations,FinalExam

ReferenceMaterials:

1. Dataand ComputerCommunications, 10th EditionbyWilliamStallings
2. ComputerNetworking:A Top-DownApproachFeaturingtheInternet,6th editionbyJames F.KuroseandKeithW.Ross
3. ComputerNetworks,5thEditionbyAndrew S.Tanenbaum
4. Data Communication and ComputerNetworks, 5th Edition byBehrouzA.Forouzan

CMPC-301Database Systems			
CreditHours:	4(3,1)	**Prerequisites:**	None

CourseLearningOutcomes (CLOs):		
Atthe endofthecourse thestudents willbeable to:	**Domain**	**BT Level***
1.Explainfundamentaldatabaseconcepts.	C	2
2.Designconceptual,logicalandphysicaldatabaseschemasusingdif- ferent data models.	C	3
3.Identifyfunctionaldependenciesandresolvedatabaseanomaliesby normalizing database tables.	C	3
4.UseStructuredQueryLanguage(SQL)fordatabasedefinitionand manipulation in any DBMS	C	3

*BT=Bloom‘sTaxonomy,C=Cognitivedomain,P=Psychomotordomain,A=Affective domain

CourseContent:
1. DatabasesOverview:BasicConceptsandDefinitions,TraditionalFileProcessing&Data- base Approach [TB1: Ch 1] 2. Data Models, Advantages of Database Approach, Costs and Risks of Database Approach, Components of the Database Environment, The Database Development Process [TB1: Ch 1] 3. E-RModel,ModellingRulesoftheOrganisation,ModellingEntitiesandAttributes,Mod- elling Relationships [TB1: Ch 2] 4. EnhancedE-RModel,RepresentingSupertypesandSubtypes,SpecifyingConstraintsin Supertype/Subtype Relationships [TB1: Ch 3] 5. RelationalDataModel,IntegrityConstraints,TransformingEERDiagramsintoRelations [TB1: Ch 4] 6. IntroductiontoNormalization,FirstNormalForm,SecondNormalForm,ThirdNormal Form, Functional Dependencies and Keys [TB1: Ch 4] 7. ThePhysicalDatabaseDesignProcess,DesigningFields:ChoosingDataTypes,Coding Techniques, Handling Missing Data [TB1: Ch 5] 8. Denormalizing and Partitioning Data, File Organizations (Heap, Sequential, Indexed, Hashed),CreatingaUnique/NonuniqueKeyIndex,WhentoUseIndexes[TB1:Ch5] 9. Introduction to SQL,TheSQLEnvironment, DefiningaDatabasein SQL[TB1:Ch6] 10. BasicSQLCommands forProcessingSingleTables [TB1: Ch6] 11. SQLCommands forProcessingMultiple TablesusingJoins andSubqueries[TB1: Ch7] 12. Client/ServerArchitectures,DatabasesinaTwo-TierArchitecture,Three-TierArchitec- tures [TB1: Ch 8] 13. WebApplicationComponents,DatabasesinThree-TierApplications [TB1:Ch8] 14. TheRolesofDataandDatabaseAdministrators,DatabaseBackupandRecovery,Typesof Database Failure, Disaster Recovery [TB1: Ch 12] 15. ControllingConcurrentAccess,Serializability,LockingMechanisms,DataDictionaries and Repositories [TB1: Ch 12]
TeachingMethodology:
Lectures,WrittenAssignments,Practicallabs,SemesterProject,Presentations
CourseAssessment:
SessionalExam,HomeAssignments,Quizzes,Project,Presentations,FinalExam
ReferenceMaterials:
1. ModernDatabaseManagementbyJeffreyA.Hoffer,V.Ramesh,andHeikkiTopi.Pear- son; 12th Edition (2015). ISBN-10: 1292101857 2. FundamentalsofDatabaseSystemsbyR.ElmasriandS.Navathe.Pearson;7thEdition(2015). ISBN-10: 0133970779 3. DatabaseSystemConceptsbyAbrahamSilberschatz,HenryF.KorthandS.Sudarshan. McGraw-Hill Education; 6th Edition (2010). ISBN-10: 0073523321 4. Oracle12c:SQLbyJoanE.Casteel.CengageLearning;3rdEdition(2015).ISBN-10: 1305251032

CMPC-303Information Security			
CreditHours:	3(3,0)	**Prerequisites:**	Computer Networks

CourseLearningOutcomes (CLOs):		

Attheend ofthecourse thestudentswillbeable to:	**Domain**	**BT Level***
1.Explainkeyconceptsofinformationsecuritysuchasdesignprinci- ples, cryptography, risk management, and ethics	C	2
2.Discusslegal,ethical,andprofessionalissuesininformationsecuri- ty.	A	2
3.Applyvarioussecurityandriskmanagementtoolsforachievingin- formation security and privacy.	C	3
4.Identifyappropriatetechniquestotackleandsolveproblemsinthe discipline of information security.	C	4
*BT=Bloom‘sTaxonomy,C=Cognitivedomain,P=Psychomotordomain,A=Affective domain		

CourseContent:

1. Informationsecurityfoundations,securitydesignprinciples;securitymechanisms [TB:Ch1]
2. Vulnerabilitiesandprotections:Malwares [TB:Ch6]
3. Hashfunctions[TB:Ch2, 21]
4. Digitalsignatures[TB:Ch2]
5. Keymanagement[TB:Ch2,20]
6. Authentication: Accesscontrol[TB:Ch3,4]
7. Symmetriccryptography: SymmetricEncryption Principles,DataEncryptionStandard,
8. AdvancedEncryptionStandard, CipherBlockModes ofOperation[TB:Ch20]
9. Asymmetriccryptography:HMAC,TheRSAPublic-KeyEncryptionAlgorithm,Diffie-Hellman and Other Asymmetric Algorithms [TB:Ch21]
10. Softwaresecurity[TB:Ch11]
11. Databasesecurity:TheNeedfor DatabaseSecurity,DatabaseManagementSystems
1. RelationalDatabases,SQLInjectionAttacks,DatabaseAccessControl,Inference,Data- base Encryption [TB:Ch5]
12. Network security: Secure E-Mail and S/MIME, DomainKeys Identified Mail, Secure SocketsLayer(SSL)andTransport LayerSecurity(TLS),HTTPS, IPv4andIPv6Securi- ty, Wireless Security, Mobile Device Security [TB:Ch22, 24]
13. Firewalls:TheNeedforFirewalls,FirewallCharacteristicsandAccessPolicy,Typesof Firewalls, Firewall Basing [TB:Ch9]
14. Intrusiondetection:Intruders,IntrusionDetection,AnalysisApproaches,TypesofIDS [TB:Ch8]
15. Securitypolicies, policyformation and enforcement, risk assessment[TB:Ch14,15]
16. Cybercrime,lawandethicsininformationsecurity,privacyandanonymityofdata [TB:Ch19]

TeachingMethodology:

Lectures,WrittenAssignments,SemesterProject,Presentations

CourseAssessment:

SessionalExam,HomeAssignments,Quizzes,Project,Presentations,FinalExam

ReferenceMaterials:

1. ComputerSecurity: Principles andPractice,3rd editionbyWilliamStallings[TB1]
2. PrinciplesofInformationSecurity, 6theditionbyM. WhitmanandH.Mattord
3. ComputerSecurity, 3rdedition byDieterGollmann

4.ComputerSecurityFundamentals,3rdeditionbyWilliamEasttom Official
(ISC)2 Guide to the CISSP CBK, 3rd edition

CMPC-401Capstone Project			
CreditHours:	6(0,6)	**Prerequisites:**	**None**

CourseLearningOutcomes (CLOs):		
Atthe endofthecourse thestudents willbeable to:	**Domain**	**BTLevel***
1. Gives an opportunity for participants to put their leadership competencies into practice. 2. Allows the student to identify and develop a project that puts into practice the leadership skills and competencies learned during the courses of study.	C A	2 3
*BT=Bloom‘sTaxonomy,C=Cognitivedomain,P=Psychomotordomain,A=Affective domain		

CourseContent:

1. ProjectProposal
2. Introduction
3. SoftwareRequirements Specification
4. SoftwareFunctionSpecification

Detailed guidelineanddocumentationtemplesareavailablewiththeDepartment.

TeachingMethodology:

Lecturing,WrittenAssignments,ReportWriting

CourseAssessment:

SessionalExam,Home Assignments,Quizzes, Presentations, FinalExam

ReferenceMaterials:

ContentsofMathematicsandScienceFoundationCourses

MATH-101CalculusandAnalyticalGeometry			
CreditHours:	3(3,0)	**Prerequisites:**	None

CourseLearningOutcomes (CLOs):		
Attheend ofthecourse thestudentswillbeable to:	**Domain**	**BTLevel***
Understandthefoundationandbasicgroundforcalculusandana- lytical geometry background.	C	2

*BT=Bloom‘sTaxonomy,C=Cognitivedomain,P=Psychomotordomain,A=Affective domain

CourseContent:

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 Derivativeof a Function, Differentiation Rules, Ratesof Change, Derivatives of Trigonometric Functions, The Chain Rule, Implicit Differentiation and Rational Exponents. [TB: Ch. 2]
4. Applications ofDerivatives: Extreme Valuesof Functions, TheMean 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 betweenCurves, FindingVolumes bySlicing, Volumes of Solids ofRevolution—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, ax and logax, 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. ClassifyingConic Sections byEccentricity.QuadraticEquationsandRotations. 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]

TeachingMethodology:

Lecturing,WrittenAssignments

CourseAssessment:

SessionalExam,HomeAssignments,Quizzes,FinalExam

ReferenceMaterials:

1. CalculusandAnalyticGeometrybyGeorgeB.ThomasandRossL.Finney,AddisonWes- ley; 10th Edition (1995) ISBN-10: 0201531747
2. CalculusandAnalyticalGeometrybySwokowski,OlinickandPence,6th Edition,(1994), Brooks/Cole Publishers.
3. CalculusbyHowardAnton,IrlC.Bivens,StephenDavis,Wiley;10thEdition(2012), ISBN-10: 0470647728

4. CalculuswithAnalyticGeometry:StudentSolutionManualbyHowardAnton,Wiley;5th Edition (1995). ISBN-10: 0471105899

MATH-102 Probabilityand Statistics			
CreditHours:	3(3,0)	**Prerequisites:**	None

CourseLearningOutcomes (CLOs):		
Attheend ofthecourse thestudentswillbeable to:	**Domain**	**BTLevel***
Understandtheconceptsofdataanalysis,presentation,counting techniques, probability and decision making.	C	2

*BT=Bloom‘sTaxonomy,C=Cognitivedomain,P=Psychomotordomain,A=Affective domain

CourseContent:

1. Introduction to Statistics and Data Analysis: Statistical Inference, Samples, Popula-tions, and the Role of Probability, Sampling Procedures; Collection of Data, Measures of Location:TheSampleMeanandMedian,MeasuresofVariability,DiscreteandContinuousDa- ta, Statistical Modeling, Scientific Inspection, and Graphical, General Types of Statistical Studies: Designed Experiment, Observational Study, and Retrospective Study. [TB: Ch.1]
2. Probability:SampleSpace,Events,CountingSamplePoints,ProbabilityofanEvent,Ad- ditive Rules, Conditional Probability, Independence, and the Product Rule, Bayes_ Rule. [TB: Ch. 2]
3. RandomVariablesandProbabilityDistributions: Concept ofaRandomVariable,Discrete ProbabilityDistributions,ContinuousProbabilityDistributions,JointProbabilityDistributions. [TB: Ch. 3]
4. MathematicalExpectation:MeanofaRandomVariable,VarianceandCovarianceofRan- dom Variables, Means and Variances of LinearCombinations of Random Variables, Chebyshev_s Theorem. [TB: Ch. 4]
5. Discrete Probability Distributions: Binomial and Multinomial Distributions, HypergeometricDistribution,NegativeBinomialandGeometricDistributions,PoissonDistribu- tion and the Poisson Process. [TB: Ch. 5]
6. ContinuousProbabilityDistributions: ContinuousUniformDistribution,NormalDistribution,AreasundertheNormalCurve,ApplicationsoftheNormalDistribution,NormalApproximation to the Binomial, Gamma and Exponential Distributions, Chi-Squared Distribution, Beta Distribution. [TB: Ch. 6]
7. Fundamental Sampling Distributions and Data Descriptions: Random Sampling, Sampling Distributions, Sampling Distribution of Means and the Central Limit Theorem. Sampling Distribution of S2, t-Distribution, F-Quantile and Probability Plots. [TB: Ch. 8]
8. One- and Two-Sample Estimation Problems: Introduction, Statistical Inference, Classical MethodsofSingleSample:EstimatingtheMean,StandardErrorofaPoint,Pre-dictionIn-

tervals,ToleranceLimits, Estimatingthe DifferencebetweenTwoMeans.[TB:Ch. 9]

9. Single Sample: Estimating a Proportion, Estimating the Difference between Two Proportions,SingleSample:EstimatingtheVariance,EstimatingtheRatioofTwoVariances. [TB: Ch. 9]
10. One- and Two-Sample Tests of Hypotheses: Statistical Hypotheses: General Concepts, TestingaStatisticalHypothesis,TheUseofP-ValuesforDecisionMakinginTestingHypotheses. [TB: Ch. 10]
11. Single Sample: Tests Concerning a Single Mean, Two Samples: Tests on Two Means, ChoiceofSampleSizeforTestingMeans,GraphicalMethodsforComparingMeans,One Sample: Test on a Single Proportion, Two Samples: Tests on Two Proportions. [TB: Ch. 10]
12. One-andTwo-SampleTestsConcerningVariances,Goodness-of-FitTest,TestforIndependence (Categorical Data), Test for Homogeneity [TB: Ch. 10]
13. SimpleLinearRegressionandCorrelation:Introductionto LinearRegression,TheSimple Linear Regression Model, Least Squares and the Fitted Model, Properties of the Least Squares Estimators. [TB: Ch. 11]
14. 14.MultipleLinearRegressionandCertain:NonlinearRegressionModels,Introduction, Estimating the Coefficients, Linear Regression Model Using Matrices, Properties of the LeastSquaresEstimators. [TB: Ch. 12]

TeachingMethodology:

Lecturing,WrittenAssignments

CourseAssessment:

SessionalExam,HomeAssignments,Quizzes,FinalExam

ReferenceMaterials:

1. Probabilityand Statisticsfor Engineersand Scientists byRonald E. Walpole, Raymond H. Myers,Sharon L.MyersandKeyingE.Ye,Pearson;9th Edition(January6,2011).ISBN- 10: 0321629116
2. ProbabilityandStatisticsforEngineersandScientistsbyAnthonyJ.Hayter,DuxburyPress; 3rd Edition (February 3, 2006), ISBN-10: 0495107573
3. Schaum'sOutlineofProbabilityandStatistics,byJohnSchiller,R.AluSrinivasanandMur- ray Spiegel, McGraw-Hill; 3rd Edition (2008). ISBN-10: 0071544259
4. Probability:AVeryShortIntroductionbyJohnHaigh,OxfordUniversityPress(2012). ISBN-10: 0199588481

MATH-203Linear Algebra			
CreditHours:	3(3,0)	**Prerequisites:**	None

CourseLearningOutcomes (CLOs):		
Attheend ofthecourse thestudentswillbeable to:	**Domain**	**BTLevel***
Understand the fundamentals of solution for system of linear equations, operations on system of equations, matrix properties, solutions and study of their properties.	C	2

*BT=Bloom‘sTaxonomy,C=Cognitivedomain,P=Psychomotordomain,A=Affective domain

CourseContent:

1. IntroductiontoVectors:VectorsandLinearCombinations,LengthsandDotProducts,Ma- trices. [TB1: Ch. 1]
2. SolvingLinearEquations:VectorsandLinearEquations,theIdeaofElimination,Elimina- tion Using Matrices, Rules for Matrix Operations, Inverse Matrices. [TB1: Ch. 2]
3. Elimination=Factorization;A=LU,TransposesandPermutations
4. Vector Spaces and Subspaces: Spaces of Vectors, The Null spaceof A: Solving Ax = 0, TheRankandtheRowReducedForm,theCompleteSolutiontoAx=B,Independence, Basis and Dimension, Dimensions of the Four Subspaces. [TB1: Ch. 3]
5. Orthogonally:OrthogonallyoftheFourSubspaces,Projections,LeastSquaresApproxima- tions, Orthogonal Bases and Gram-Schmidt. [TB1: Ch. 4]
6. Determinants:ThePropertiesofDeterminants,PermutationsandCofactors,Cramer'sRule, Inverses, and Volumes. [TB1: Ch. 5]
7. Eigenvalues and Eigenvectors: Introduction to Eigenvalues, Diagonalizing a Matrix, Ap- plicationstoDifferentialEquations,SymmetricMatrices,PositiveDefiniteMatrices,Simi- lar Matrices, Singular Value Decomposition (SVD). [TB1: Ch. 6]
8. Applications:MatricesinEngineering,GraphsandNetworks,MarkovMatrices,Popula- tion,andEconomics; LinearProgramming,Fourierseries:LinearAlgebraforFunctions, Linear Algebra for Statistics and Probability, Computer Graphics.
9. NumericalLinearAlgebra:GaussianEliminationinPractice,NormsandConditionNum- bers, Iterative Methods for Linear Algebra. [TB1: Ch. 9]
10. 10.ComplexVectorsandMatrices:ComplexNumbers,HermitianandUnitaryMatrices, Matrix Factorizations. [TB1: Ch. 10]

TeachingMethodology:

Lecturing,WrittenAssignments

CourseAssessment:

SessionalExam,HomeAssignments,Quizzes,FinalExam

ReferenceMaterials:

1. IntroductiontoLinearAlgebrabyGilbertStrang,WellesleyCambridgePress;4thEdition (February 10, 2009). ISBN-10: 0980232716
2. ElementaryLinearAlgebrawithApplicationsbyBernardKolman,DavidHill,9thEdition, Prentice Hall PTR, 2007. ISBN-10: 0132296543
3. Strang'sLinearAlgebraAndItsApplicationsbyGilbertStrang,Strang,BrettCoonley, Andy Bulman-Fleming, Andrew Bulman-Fleming, 4th Edition, Brooks/Cole, 2005
4. ElementaryLinearAlgebra:ApplicationsVersionbyHowardAnton,ChrisRorres,9thEdi- tion, Wiley, 2005.
5. LinearAlgebraandItsApplicationsbyDavid C.Lay,2ndEdition,Addison-Wesley,2000.
6. LinearAlgebrabyHaroldM.Edwards,Birkhäuser;1stEdition(2004).ISBN-10: 0817643702
7. LinearAlgebra:AModernIntroductionbyDavid PoolebyBrooksCole;3rdEdition(May 25, 2010).ISBN-10: 0538735457

PHYS-101Applied Physics			
CreditHours:	3(3,0)	**Prerequisites:**	None

CourseLearningOutcomes (CLOs):		
Attheend ofthecourse thestudentswillbeable to:	**Domain**	**BTLevel***
Understandthebasiclawsofphysics,circuitingandbasicsof transistors.	C	2

*BT=Bloom‘sTaxonomy,C=Cognitivedomain,P=Psychomotordomain,A=Affective domain

CourseContent:

1. Zero Reference Level, Chassis Ground, Ohm_s Law, Formula Variations of Ohm_s Law, Graphical RepresentationofOhm_s Law, LinearResistor,Non LinearResistor,CellsinSe- ries and Parallel.[Ch 1]
2. ResistiveCircuits. [Ch2]
3. Resistors(5.1-15),Inductors(5.19-21)Capacitors(5.35-48).[Ch5]
4. EnergySources.[Ch6]
5. Magnetismandelectromagnetism[Ch7].
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-NJunction.Formation ofdepletionlayer,Junctionorbarrier voltage, ForwardbiasedP-N Junction, Forward V/I Characteristics, Reverse biased P-N Junction, Re-verse 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. TheBasic Transistor.TransistorBiasing, TransistorCircuitConfiguration.[Ch18]
11. Modulation and Demodulation. Carrier Waves, Modulation, Demodulation or Detection, Comparison between Amplitude Modulation (AM) and Frequency Modulation (FM). [Ch 30]
12. IntegratedCircuits.Advantagesof ICs and Drawbacksof 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. FibreOptics.StructureofOpticalFibres,ClassificationofOpticalFibres, FibreCharacteris- tics, Choice of Wavelength, Optical Fibre cable, Application of Fibre Optic Communica- tion. [Ch 38]

TeachingMethodology:

Lecturing,WrittenAssignments, Presentations

CourseAssessment:

SessionalExam,HomeAssignments,Quizzes,Presentations,FinalExam
ReferenceMaterials:
1. A Practical English Grammar by A. J. Thomson and A. V. Martinet,4th Edition Oxford University Press (1986). 2. Basic English Usage by Michael Swan, Oxford UnivPr (Sd) (January 1986). ISBN-10: 0194311872 3. Functional English In AglobalSociety: VocabularyBuildingand CommunicativeGrammar by Nicanor L. Guintomary Ann R. Sibal Brian D. Villaverde Dept. of Lan-guages, Litera-ture and Humanities College of Arts and Sciences Southern Luzon State University(2012). 4. AQA Functional English Student Book: Pass Level 2 by Mr David Stone, Heinemann; 1st Edition (28 Jun 2010). ISBN-10: 0435151401 5. English Composition and Grammar:CompleteCourse byJohn E. Warriner, Harcourt Brace Jovanovich; Complete Course Benchmark Edition (January 1988). ISBN-10: 0153117362 6. Companion to English: Vocabulary (Learners Companion) by George Davidson, Prim-Ed Publishing (March 1, 2003). ISBN-10: 9814070904 7. Word Power Made Easy by Norman and Lewis, Goyal Publishers (September 1, 2009). ISBN-10: 8183071007 8. 1000 Most Important Words by Norman W. Schur, Ballantine Books (July 12, 1982). ISBN-10: 0345298632 9. High School English Grammar and Composition by P.C Wren, Chand & Co (July 13, 2008). ISBN-10: 812192197X

ContentsofGeneralEducationCourses

ENGL-101EnglishCompositionandComprehension			
CreditHours:	3(3,0)	**Prerequisites:**	None

CourseLearningOutcomes (CLOs):		
Attheend ofthecourse thestudentswillbeable to:	**Domain**	**BTLevel***
1. 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.	C	2
2. This 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.	C	2
*BT=Bloom‘sTaxonomy,C=Cognitivedomain,P=Psychomotordomain,A=Affective domain		

CourseContent:
1. Punctuation:Periods,QuestionMarks,ExclamationMarks,Semicolons,Colons,Com-mas, Apostrophes, Quotation Marks. 2. WritingMechanics:Capitals,Abbreviations;Vocabulary:FrequentlyConfusedWords, Frequently Misused Words, 3. Vocabulary:Phrases,Synonyms,Antonyms, Idioms,GeneralVocabulary

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. Kindsof Nouns; Kindsof Adjectives; Adverbs: Kinds,Form, Position and Use
6. Prepositions;Possessive,PersonalandReflexivePronouns;RelativePronounsandClaus- es
7. Classes of Verbs: Ordinary Verbs, Auxiliary Verbs (Be, Have, Do); May and Can for Permission and Possibility; Can and Be Able for Ability; Ought, Should, Must, Have To, Need for Obligation; Must, Have, Will and Should for Deduction and Assumption; The Auxiliaries Dare and Used
8. ThePresentTenses
9. ThePastandPerfectTenses
10. TheFuture;The Infinitive
11. TheGerund&TheParticiples;Commands,Requests,Invitations,Advice,Suggestions; The Subjunctive
12. ThePassiveVoice;IndirectSpeech
13. Conjunctions, Purpose
14. Clauses:NounClauses;ClausesofReason,Result,Concession,Comparison,Time Numerals,Dates,andWeights AndMeasures; SpellingRules; PhrasalVerbs;ListOfIrregularVerbs

TeachingMethodology:

Lecturing,WrittenAssignments, Presentations

CourseAssessment:

SessionalExam,HomeAssignments,Quizzes,Presentations,FinalExam

ReferenceMaterials:

1. A Practical English Grammar by A. J. Thomson and A. V. Martinet,4th Edition Oxford University Press (1986).
2. Basic English Usage by Michael Swan, Oxford UnivPr (Sd) (January 1986). ISBN-10: 0194311872
3. Functional English In AglobalSociety: VocabularyBuildingand CommunicativeGrammar by Nicanor L. Guintomary Ann R. Sibal Brian D. Villaverde Dept. of Lan-guages, Litera- ture and Humanities College of Arts and Sciences Southern Luzon State University(2012).
4. AQA Functional English Student Book: Pass Level 2 by Mr David Stone, Heinemann; 1st Edition (28 Jun 2010). ISBN-10: 0435151401
5. English Composition and Grammar:CompleteCourse byJohn E. Warriner, Harcourt Brace Jovanovich; Complete Course Benchmark Edition (January 1988). ISBN-10: 0153117362
6. Companion to English: Vocabulary (Learners Companion) by George Davidson, Prim-Ed Publishing (March 1, 2003). ISBN-10: 9814070904
7. Word Power Made Easy by Norman and Lewis, Goyal Publishers (September 1, 2009). ISBN-10: 8183071007
8. 1000 Most Important Words by Norman W. Schur, Ballantine Books (July 12, 1982). ISBN-10: 0345298632
9. High School English Grammar and Composition by P.C Wren, Chand & Co (July 13, 2008). ISBN-10: 812192197X

ENGL-102CommunicationandPresentation Skills			
CreditHours:	3(3,0)	**Prerequisites:**	None

CourseLearningOutcomes (CLOs):		
Attheend ofthecourse thestudentswillbeable to:	**Domain**	**BTLevel***
1. Tosensitize students to their communicativebehavior 2. Toenablethemtoreflectandimproveontheircommunicative behavior/performance 3. Tobuild capacitiesfor self-criticismand facilitategrowth 4. Toleadstudents toeffectiveperformancesincommunication	C	2
*BT=Bloom‘sTaxonomy,C=Cognitivedomain,P=Psychomotordomain,A=Affective domain		

CourseContent:

1. Communication Skills: What Is Communication, The Importance of Communication,What Are Communication Skills? The Communication Process : Source, Message, Encod- ing, 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. InternalRepresentation:Introduction,InternalRepresentationofOurWorld,Languageasa 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 Con-struct, 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. CommunicationStyles: Introduction, The Communication Styles Matrix, Direct Communication Style, Spirited Communication Style, Systematic Communication Style, Considerate Communi- cation Style,Examples of Communication for EachStyle, DirectStyle,Spirited Style, Sys- tematic Style Considerate Style.
4. Listening: Real Vs. Introduction, Self-Awareness, Pseudo Listening, Active Listening, Blocks to Listening, Assessing Your Listening, Four Steps to Effective Listening, Total Listing, Becoming an Active Listener.
5. Expressing: The Four Kinds of Expression, Whole Message, Contaminated Messages, Preparing Your Message, Practicing Whole Message, Rules of Effective Expression. Body Language: Body Movement, Spatial Relationships. Paralanguage and Meta-messages: The Element of Paralanguage, Changing Your Paralanguage, Meta-message, Coping with Meta-message. Hidden Agendas: The Eight Agendas, Purpose of the Agenda.
6. Clarifying Language: Understanding a Model, Challenging the Limits of a Model, Challenging Distortion in a Model. Assertiveness: Your Legitimate Right, Three Communication Styles, Identifying Communication Style, Your Assertive Goals, Assertive Expression and Listening, Combining Assertive Expression and Listening, Responding to Criticism, Special Assertive Strategies.
7. MakingContact:FearofStranger,GuidelinesforMakingContact,TheArtofConversa-

tion,PuttingItAllTogether.Negotiations:FourStagesofNegotiation,DealingwithCon- flicts, 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 InfluencingChange,EffectiveStrategies,for InfluencingOthers,YourPlanfor Influencing Change, Lisa_s Plan for Influencing Change Art of Persuasion.
10. Public Speaking: Defining Your Purpose, Outlining The Subject, Presentation, Organization,Audience Analysis, Style,SupportingMaterials,The Outline,Delivery, Deal-ingwith 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, Feedback, Preliminary Preparations Proximity, Tension & Nerves, Questions, Tips to Handle Questions, Habits, Handling Tough Situations, Common Mistakes & Their Remedies, Dealing with Unexpected Disasters, Presentation for International Audience, Dealing People with Disabilities, Things to Remembers, Last Minute Tips.
13. Interviewing: Clarifying What You Want, IfYou arethe 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.

TeachingMethodology:

Lecturing,WrittenAssignments, ReportWriting, Presentations

CourseAssessment:

SessionalExam,HomeAssignments,Quizzes,Presentations,FinalExam

ReferenceMaterials:

1. Effective Communication Skills, MTD Training &Ventus Publishing ApS.(2010) ISBN 978-87-7681-598-1 (TB1)
2. Messages: The Communication Skills Book by Matthew McKay PhD , Martha Davis PhD, and PatrickFanning, New Harbinger Publications; Third Edition (March 3, 2009). ISBN-10: 1572245921
3. Secrets of Successful Presenters: A Guide for Successful Presenters by Dr. M. A. Pa-sha &Dr. S. Pasha, Lambert Academic Publishing (2012). ISBN-10:3659217557
4. Communication Skills in English byProf P N Kharu, Dr.Varinder Gandhi Publisher: Laxmi. EAN: 9788131806920

5. EssentialCommunicationSkills: TeacherEditionwithTalkingPointsbyPattyAnn,Patty Ann; 1st Edition (July 5, 2012). ASIN: B008HYUDWQ
6. Communication Skills Magic: Improve Your Relationships & Productivity through Better UnderstandingYourPersonality StyleandthePersonality StylesofThoseAroundYouby E.G.Sebastian,CreateSpaceIndependentPublishingPlatform(Janu-ary5,2010).ISBN-10: 1450513344
7. PeopleSkills:HowtoAssertYourself,ListentoOthers,andResolveConflictsbyRobert Bolton,Touchstone (June 6, 1986). ISBN-10: 067162248X
8. TheHandbookofCommunicationSkillsbyOwenHargie,Routledge;4thEdition,Taylor& Francis, (12-Oct-2012).

ENGL-302TechnicalandBusiness Writing			
CreditHours:	3(3,0)	**Prerequisites:**	None

CourseLearningOutcomes (CLOs):		
Attheend ofthecourse thestudentswillbeable to:	**Domain**	**BTLevel***
Effectivelyplanandstructuretechnicalreportsandtorecognize the various stages in writing a technical report.	C	2

*BT=Bloom‘sTaxonomy,C=Cognitivedomain,P=Psychomotordomain,A=Affective domain

CourseContent:

1. Writing for Readers: Academic, Public, and Work Communities; Analyzing Electron-ic Communities; c. Myths and Realities about Writing.
2. Discovering and Planning: Discovering Topics; Generating Ideas; Organizing Infor-mation; Planning in Digital Environments.
3. Purpose, Thesis, and Audience: Identifying Your Focus and Purpose; Creating a The-sis; Understanding Your Readers.
4. Drafting:MovingfromPlanningto Drafting, DraftingCollaboratively, DraftinginDigi- tal Environments.
5. Revising, Editing, and Proofreading: Making Major Revisions; Making Minor Revi-sions; Revising Collaboratively; Revising in Digital Environments; Editing; Editing Collaboratively; Proofreading.
6. Paragraphs: Unfocused Paragraphs; Revising for Focus; Incoherent Paragraphs; Re-vising for Coherence; Poorly Developed Paragraphs; Revising for Development; Us-ing Special-Purpose Paragraphs.
7. Clear and Emphatic Sentences: Unclear Sentences; Revising for Clear Sentences; Re-vising 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 Ar-gumentativeThesis,DevelopingReasonsandEvidence,AcknowledgingOtherPerspec-

tives,ArguingLogically,WritingaPosition Paper.

11. Designing Documents: Goals of Document Design, Format Choice, Layout, Type Choice,Visuals, Sample Documents. Creating a VisualArgument: Presentingan Is-sue, Providing Evidence.
12. Writing in Online Communities: Online Expectations, E-mail Conventions, Online Communities, Web Pages, Avoiding Plagiarism and Behaving EthicallyOnline.
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 NaturalSciences,
15. Abstract,InformativeReport, LabReport,ResearchReport,
16. PublicWriting:GoalsofPublicWriting,PublicAudiences,PublicWritingTasks,Types of Public Writing, Public Flyer, Letter to the Editor, Oral Presentation.
17. Researching and Writing: Beginning Your Research, Types of Research Writing, De-veloping a Research Question, Developing a Preliminary Thesis, Creating a Re-search File and a Timeline, Reading and Notetaking, Summarizing, Paraphrasing, and Synthe-sizing.

TeachingMethodology:

Lecturing,WrittenAssignments, ReportWriting, Presentations

CourseAssessment:

SessionalExam,HomeAssignments,Quizzes,Presentations,FinalExam

ReferenceMaterials:

1. Writer'sCompanion–TheLongmanbyChrisM.Anson,RobertA.SchweglerandMarcia F.Muth,Pearson Longman,4thEdition(2007).ISBN10:0-20556-252-3
2. TechnicalEnglish:Writing,Reading,andSpeakingbyPickettandLaster.8thEdition.
3. TheTechnicalWriter_sCompanionbyAlred,Gerald,CharlesT.BrusawandWalterE.Oliu, 3rd Edition. ISBN 0-312-25978-6.

PKST-401Islamic Studies			
CreditHours:	2(2,0)	**Prerequisites:**	None

CourseLearningOutcomes (CLOs):		
Attheend ofthecourse thestudentswillbeable to:	**Domain**	**BTLevel***
1-EnhanceunderstandingofthestudentsregardingIslamicCiviliza- tion	C	2
2-ImproveStudentsskill toperformprayersandotherworships	C	2
3-Enhancetheskillofthestudentsforunderstandingofissuesrelated to faith and religious life.	C	2

*BT=Bloom‘sTaxonomy,C=Cognitivedomain,P=Psychomotordomain,A=Affective domain

CourseContent:

TheapprovedSyllabus of respective departmentofUOS willbefollowed **TeachingMethodology:**
Lecturing,WrittenAssignments, Class Discussion
CourseAssessment:
SessionalExam,HomeAssignments,Quizzes,Presentations,FinalExam
ReferenceMaterials:

ISLS-402Pakistan Studies			
CreditHours:	2(2,0)	**Prerequisites:**	None

CourseLearningOutcomes (CLOs):		
Attheend ofthecourse thestudentswillbeable to:	**Domain**	**BTLevel***
1:Developvisionofhistoricalperspective,government,politics,contemporary Pakistan, ideological background of Pakistan.	C	2
2:Studytheprocessofgovernance,nationaldevelopment,issuesarising in the modern age and posing challenges to Pakistan.	C	2
*BT=Bloom‘sTaxonomy,C=Cognitivedomain,P=Psychomotordomain,A=Affective domain		

CourseContent:
TheapprovedSyllabus of respective departmentofUOS willbefollowed **TeachingMethodology:**
Lecturing,WrittenAssignments, Class Discussion
CourseAssessment:
SessionalExam,HomeAssignments,Quizzes,Presentations,FinalExam
ReferenceMaterials:

ICTC-101Introductionto InformationandCommunication Technology			
CreditHours:	3(2,1)	**Prerequisites:**	None

CourseLearningOutcomes (CLOs):		
Attheend ofthecourse thestudentswillbeable to:	**Domain**	**BTLevel***
1.Getbasicunderstandingofcomputersoftware, hardware, and associated technologies.	C	2
2.Learnhowcomputers areused in the workplace, how commu-	C	2

nicationssystemscanhelpboostproductivity,andhowtheIn- ternet technologies can influence the workplace.		

*BT=Bloom‘sTaxonomy,C=Cognitivedomain,P=Psychomotordomain,A=Affective domain

CourseContent:

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, Soft-ware for Home, Personal, and Educational Use, Web Applications, Application Soft-ware 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 In-put, 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 Ear buds, Other Output Devices. [Ch. 6]
7. Storage: Hard Disks, Flash Memory Storage, Cloud Storage, Optical Discs, Other Types of Storage. [Ch. 7]
8. System Software: Operating Systems, Operating System Functions, Types Of Operating Systems, Stand-Alone Operating Systems, Server Operating Systems, Embedded Operating Systems, Utility Programs [Ch. 8]
9. Communications: Uses of Computer Communications, Networks, Network Communications Standards, Communications Software, Communications over the Telephone Network, Communications Devices, Home Networks, Communications Channel, Physical Transmission Media, Wireless Transmission Media. [Ch. 9]
10. Databases: Data, and Information, The Hierarchy of Data, Maintaining Data, File Processing Versus Databases, Database Management Systems, Relational, Object-Oriented, and Multidimensional Databases, Web Databases, Database Administration
11. Computer Security and Safety, Ethics, and Privacy: Computer Security Risks, Internet And Network Attacks, Unauthorized Access And Use, Hardware Theft And Vandal-ism, Software Theft, Information Theft, System Failure, Backing Up, Wireless Security,Health Concerns Of Computer Use, Ethics And Society

TeachingMethodology:

Lecturing,WrittenAssignments, Class Discussion

CourseAssessment:

SessionalExam,HomeAssignments,Quizzes,Presentations,FinalExam

ReferenceMaterials:

1. DiscoveringComputers byGaryB.Shelly&MistyE.Vermaat,Course Technology;1st Edition (January 25, 2011).
2. ComputingEssentials2012byTimothyJ.O'LearyandLindaI.O'Leary,McGrawHill Higher Education; 22nd Revised Edition (February 1, 2011).
3. Computers:UnderstandingTechnologybyFuller,Floyd;Larson,Brian,FourthEdi-tion, ISBN: 978-0-76383-927-7 (OR Latest Edition.)
4. TheConceptsofInformationTechnologybyImranSaeed,AfsanRaza,TariqMah-moodand ZafarHussain, 6th Edition, IT Series Publications.
5. TheEssentialGuideto Computing:TheStoryofInformationTechnologybybyEGarrison Walters, Prentice Hall PTR (August 11, 2000). ISBN-10: 0130194697
6. ComputerApplicationsbyTasleemMustafa,TariqMahmood,ImranSaeedandZa-hidJaved, IT Publication Series

ITSCC-201Professional Practice			
CreditHours:	3(3,0)	**Prerequisites:**	None

CourseLearningOutcomes (CLOs):		
Attheend ofthecourse thestudentswillbeable to:	**Domain**	**BTLevel***
1.Understandresponsibilitieswith respecttothe society	C	2
2.Understandhistorical,social,economic,ethical,andprofessional issuesrelatedto thedisciplineofComputing	C	2
3.Itidentifieskeysourcesforinformationandopinionaboutpro-fessionalism and ethics.	C	2
4.Analyze,evaluate,andassessethicalandprofessionalcomputing case studies.	C	2

*BT=Bloom‘sTaxonomy,C=Cognitivedomain,P=Psychomotordomain,A=Affective domain

CourseContent:

1. TheEngineeringProfession[TB:Ch.1]
2. TheStructure ofOrganizations [TB: Ch.2]
3. Financeand Accounting [TB: Ch. 3]
4. Anatomyof a Software House [TB: Ch.4]
5. ComputerContracts [TB:Ch. 5]
6. IntellectualPropertyRights [TB:Ch.6]
7. TheFrameworkofEmployeeRelationsLawandChangingManagementPractices[TB:Ch. 7]
8. HumanResource Management andSoftware Engineering[TB: Ch.8]
9. Healthand Safetyat Work[TB: Ch.9]
10. SoftwareLiability:LiabilityandPractice[TB: Ch.10]
11. ComputerMisuseandtheCriminalLaw[TB:Ch.11]
12. RegulationandControlofPersonalInformation:DataProtection,DefamationandRelated Issues

[TB:Ch. 12]
13. The British Computer SocietyCodeof Conduct[Online]
14. IEEE Code ofEthics[Online]
15. ACMCode ofEthics andProfessional Conduct[Online]
16. ACM/IEEE SoftwareEngineeringCode ofEthics and ProfessionalPractice[Online]

TeachingMethodology:

Lecturing,WrittenAssignments, Class Discussion

CourseAssessment:

SessionalExam,HomeAssignments,Quizzes,Presentations,FinalExam

ReferenceMaterials:

1. Professional Issues in Software Engineering by Frank Bott, Allison Coleman, Jack Eatonand Diane Rowland, CRC Press; 3rd Edition (2000). ISBN-10: 0748409513
2. Online Resources
3. AGiftofFire:Social,Legal,andEthical IssuesforComputingandthe Internet(3rdEdition) by Sara Baase, Prentice Hall; 3rd Edition (2008). ISBN-10: 0136008488
4. Applied Professional Ethics by Gregory R. Beabout, University Press Of America (1993). ISBN-10: 0819193747.
5. The Dark Side of Software Engineering: Evil on Computing Projects by Johann Rost and Robert L. Glass, Wiley-IEEE Computer Society Pr; 1st Edition (2011). ISBN-10: 0470597178
6. Software Engineering Best Practices: Lessons from Successful Projects in the Top Companies by Capers Jones, McGraw-Hill Osborne Media; 1st Edition (2009). ISBN-10: 007162161X

ContentsofUniversityElectiveCourses

BUSB-102Business Economics			
CreditHours:	3(3,0)	**Prerequisites:**	None

CourseLearningOutcomes (CLOs):		
Attheend ofthecourse thestudentswillbeable to:	**Domain**	**BT Level***
Thiscourseismeanforunderstandingcoremattersofeconomicsso that student shall be able to understand what is going on globally. Thiscourse,alongwithEntrepreneurshipcourse,shallhelpstudents to establish their own business.	C	3
*BT=Bloom‘sTaxonomy,C=Cognitivedomain,P=Psychomotordomain,A=Affective domain		

CourseContent:

1. IntroductiontoBusinessandthe economicenvironment [TB:Ch. 1]
2. Theworkingofcompetitivemarkets [TB: Ch.2]
3. Demandand theconsumer [TB:Ch. 3]
4. Supplydecisionsinaperfectlycompetitivemarket[TB:Ch.4]
5. Pricingand output decisions inimperfectlycompetitive markets [TB: Ch.5]

6. Businessgrowthandstrategy[TB:Ch. 6]
7. Multinational corporationsand businessstrategyinaglobaleconomy[TB:Ch.7]
8. Government,thefirmandthemarket [TB:Ch. 9]
9. The economyandbusiness activity[TB:Ch.10]
10. Nationalmacroeconomicpolicy[TB:Ch.11]
11. The globaltradingenvironment [TB: Ch.12]

TeachingMethodology:

Lectures,Class Discussions

CourseAssessment:

MidtermExam, HomeAssignments, Quizzes,FinalExam

ReferenceMaterials:

1. JohnSlomanandElizabethJones,EssentialsEconomicsforBusiness,5th Ed.,Pearson, 2017.[TB]
2. AlanGriffithsandStuartWall,EconomicsforBusiness&Management:AStudentText, Prentice Hall, 2005
3. DermotMcAleese,EconomicsforBusiness:Competition,Macro-stabilityandGlobalisation, 3rd Ed., Prentice Hall, 2009.

BUSB-302**HumanResourcesManagement**			
CreditHours:	3(3,0)	**Prerequisites:**	None

CourseLearningOutcomes (CLOs):		
Attheend ofthecourse thestudentswillbeable :	**Domain**	**BTLevel***
1-CoreaspectsofHumanResourceManagementrequiredin 21st Century organizations	C	3

*BT=Bloom‘sTaxonomy,C=Cognitivedomain,P=Psychomotordomain,A=Affective domain

CourseContent:

1- ManagingHumanResources. [TB:Ch. 1]
2- Understandingthe External and Organizational Environments. [TB: Ch.2]
3- EnsuringFairTreatment andLegalCompliance.[TB: Ch.3]
4- HRPlanningforAlignmentand Change.[TB: Ch.4]
5- UsingJob Analysis andCompetencyModeling. [TB:Ch.5]
6- Recruitingand RetainingQualifiedEmployees.[TB: Ch.6]
7- SelectingEmployeesto FittheJob and the Organization. [TB: Ch. 7]
8- Trainingand DevelopingaCompetitive Workforce. [TB: Ch. 8]
9- ConductingPerformance Management. [TB:Ch. 9]
10- Developingan Approachto TotalCompensation.[TB: Ch.10]
11- UsingPerformance-Based Payto Achieve StrategicObjectives. [TB: Ch.11]
12- ProvidingBenefitsandServicesforEmployees'Well-Being.[TB: Ch.12]
13- RiskManagement,EmployeeRelations,andRiskManagement,Health,Safety,andEmployee Well-Being. [TB: Ch. 13]

14-UnderstandingUnionizationand CollectiveBargaining.[TB:Ch. 14]
TeachingMethodology:
Lecturing,WrittenAssignments, Problem Solving
CourseAssessment:
SessionalExam,HomeAssignments,Quizzes,Presentations,FinalExam
ReferenceMaterials:
1-ManagingHumanResourcesbySusan E.Jackson,Randall S.SchulerandSteve Werner,South-WesternCollegePub;11thEdition(June16,2011).ISBN-10:1111580227[TB] 2-Management of Human Resources by Gary Dessler, CarolinRekar Munro and Nina D. Cole, Pearson Education Canada; 3rd Edition (February 28, 2010). ISBN-10: 0321687140

BUSB-202PrinciplesofManagement			
CreditHours:	3(3,0)	**Prerequisites:**	None

CourseLearningOutcomes (CLOs):		
Atthe endof thecourse the studentswillbeable to :	**Domain**	**BTLevel***
1. Cover topics fundamentals and principles of management, administrative police, objectives, and procedures and problems of organizational control and leadership.	C	2
*BT=Bloom‘sTaxonomy,C=Cognitivedomain,P=Psychomotordomain,A=Affective domain		

CourseContent:

1. Introduction to Managers and Management: What as Management and What Do Managers Do? Defining Management, Management Functions, Management Roles, Management Skills, History of Management.[TB2: Ch. 1]
2. Organizational Culture and Environment: The Manager: Omnipotent or Symbolic? The Organization_s Culture, The Environment - Defining Environment, The Specific Environment, The General Environment, Influence on Management Practice. [TB1: Ch. 3]
3. Decision Making The Essence of Manager_s Job: The Decision Making Process, The Rational Decision Maker, Decision Making Styles, Analyzing Decision Alternatives – Certainty, Risk, Uncertainty. [TB1: Ch. 6]
4. Planning: The Foundations of Planning, The Definition of Planning, Purposes of Planning, Types of Plans, Contingency Factors on Planning, Objectives: The Foundation for Planning, Multiplicity of Objectives, Real Versus Stated Objectives, Traditional Objective Setting, Management by Objectives. [TB2: Ch. 3]
5. OrganizationStructureandDesign:DefiningOrganizationStructureandDesign,Building, TheVerticalDimensionofOrganizations,BuildingtheHorizontalDimensionofOrganiza- tions, 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:Communicationand Interpersonal Skills,UnderstandingCommunication, Communication Styles of Men And Women, Feedback Skills, Delegation Skills_, Conflict Management Skills, Negotiation Skills [TB2: Ch. 12]

TeachingMethodology:

Lecturing,WrittenAssignments, Class Discussion

CourseAssessment:

SessionalExam,HomeAssignments,Quizzes,Presentations,FinalExam

ReferenceMaterials:

1. ManagementbyRobbins,S.P.&Coulter,Mary,PrenticeHall;10thEdition(Novem-ber3, 2008). ISBN-10: 0132090716
2. FundamentalsofManagementbyRobbins,S.P.&DeCenzo,DavidA,PrenticeHall;7th Edition (January 13, 2010). ISBN-13: 978-0132090711
3. HumanResourceManagementbyDavidA.DeCenzoandStephenP.Robbins.Wiley;7th Edition (October 10, 2001). ISBN-10: 0471397857
4. PrinciplesofManagementbyCharlesW.L.HillandStevenMcShane,McGraw-Hill/Irwin; 1st Edition (2006). ISBN-10: 0073530123
5. PrinciplesofManagementbyMasonCarpenter,FlatWorldKnowledge,Inc.(2009).ISBN- 10: 0982043074
6. ManagementbyRichardL.Daft,South-WesternCollegePub;10thEdition(January27, 2011). ISBN-10: 0538479531
7. FundamentalsofManagementbyStephenP.Robbins,DavidA.DeCenzoandMaryCoul- ter, Prentice Hall; 7th Edition (January 13, 2010). ISBN-10: 0136109829

BUSB-204 Entrepreneurship			
CreditHours:	3(3,0)	**Prerequisites:**	None

CourseLearningOutcomes (CLOs):		
Atthe endof thecourse the studentswillbeable to :	**Domain**	**BTLevel***
1. Understand the entrepreneurship process. This course 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. 2. The course gives students the tools necessaryto think creative-ly, to plan out whether their idea is marketable to investors, guide them through the launch their own business, or to sup-port an employer in launching and growing an entrepreneurial venture..	C	2
*BT=Bloom‘s Taxonomy,C=Cognitivedomain,P=Psychomotor domain,A=Affective		

domain

CourseContent:
1. Entrepreneurshipandthe EntrepreneurialMind-Set.[TB:Ch.1] 2. Entrepreneurial IntentionsandCorporateEntrepreneurship.[TB:Ch.2] 3. EntrepreneurialStrategy:GeneratingandExploitingNewEntries.[TB:Ch.3] 4. CreativityandtheBusinessIdea.[TB:Ch. 4] 5. IdentifyingandAnalyzingDomesticand InternationalOpportunities.[TB:Ch.5] 6. IntellectualPropertyandOtherLegalIssues fortheEntrepreneur.[TB:Ch. 6] 7. TheBusinessPlan:CreatingandStartingtheVenture.[TB: Ch.7] 8. TheMarketingPlan.[TB:Ch.8] 9. TheOrganizationalPlan.[TB: Ch. 9] 10. TheFinancial Plan.[TB: Ch.10] 11. Sourcesof Capital. [TB:Ch.11] 12. InformalRiskCapital, VentureCapital, andGoingPublic.[TB: Ch.12] 13. Strategies forGrowthandManagingtheImplicationofGrowth.[TB: Ch.13] 14. SuccessionPlanningandStrategiesforHarvesting and Endingthe Venture. [TB: Ch.15]
TeachingMethodology:
Lecturing,WrittenAssignments, Case Studies
CourseAssessment:
SessionalExam,HomeAssignments,Quizzes,Presentations,FinalExam
ReferenceMaterials:
1. EntrepreneurshipbyRobertHisrich,MichaelPetersandDeanShepherd,McGraw-Hill/Irwin; 9th Edition (September 27, 2012). ISBN-10: 0078029198 2. Entrepreneurship: IdeasinActionbyCynthiaL.Greene,South-WesternEducationalPub; 5th Edition (January 6, 2011). ISBN-10: 0538496894 3. EntrepreneurshipbyWilliamD.BygraveandAndrewZacharakis,Wiley;2ndEdition(Oc- tober 12, 2010). ISBN-10: 0470450371 4. Entrepreneurship:Theory,Process,andPracticebyDonaldF.Kuratko,South-WesternCol- lege Pub; 8th Edition (November 14, 2008). ISBN-10: 0324590911 5. Entrepreneurship:SuccessfullyLaunchingNewVenturesbyBruceR.BarringerandDuane Ireland, Prentice Hall; 4th Edition (October 27, 2011)

SS-304Foreign Language(French,German,Arabic,Chineseetc.)			
CreditHours:	3(3,0)	**Prerequisites:**	None

CourseLearningOutcomes (CLOs):		
Atthe endof thecourse the studentswillbeable to :	**Domain**	**BTLevel***
1-Thecoursewilldevelopstudents_functionalskillsoftheof- fered language	C	2
*BT=Bloom‘sTaxonomy,C=Cognitivedomain,P=Psychomotordomain,A=Affective domain		

CourseContent:
1-FollowUOS_sRelevantDepartment_sSyllabus
TeachingMethodology:
Lecturing,WrittenAssignments, Class Discussion
CourseAssessment:
SessionalExam,HomeAssignments,Quizzes,Presentations,FinalExam
ReferenceMaterials:

ContentsofInformationTechnologyCoreCourses

ITCC-202InformationTechnologyProject Management			
CreditHours:	3 (3,0)	**Prerequisites:**	SoftwareEngineering

CourseLearningOutcomes (CLOs):		
Attheend ofthecourse thestudentswillbeable to:	Domain	BT Level*
1.Planandmanagesoftwaredevelopmentprojects successfully	C	2
2.Maximizingthereturnfromeachstageofthesoftwaredevel- opment life cycle.	C	2
3.Basic projectmanagement toolsand theirusage duringSDLC	C	4
*BT=Bloom‘sTaxonomy,C=Cognitivedomain,P=Psychomotordomain,A=Affective domain		

CourseOutline

1. Introduction: Software Project Versus Other Type of Projects Dimensions of a Software Project, Activities in SPM, Setting Goals & Objectives, Business Case, Signifi-cance 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-TechnologyMis-takes [TB2, Handouts]
3. PMIFramework,PMIProcessGroups:ProcessInitiatingProcessGroup,PlanningProcess Process Group, Executing Process, Process Monitoring and controlling, Clos-ing Process Group, Project Charter, Statement of Work.[TB2, Handouts]
4. Understanding Organizations, Organizational Structures, Functional -Project –Matrix, Or-ganizationalImpactonProjects, Identifyingstakeholders:DefineResponsibilities,Author- ity 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 Assess-ment, 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. SoftwareEffortEstimation:WorkBreakdownStructure(WBS) and ItsTypes,Estima-tion 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, Net-work Planning Models, Formulation of Network Model, Adding the Time Dimen-sions, The Forward Pass, The Backward Pass[TB1:Ch.6]
10. IdentifyingtheCriticalPath, Identify-ingthe CriticalActivitiesProject, AOA,GanttChart, (Installation & Configuration of Software Tools like MS-Project).[TB1: Ch. 6]
11. Risk Management: Categories of Risks, A Framework for Dealing with Risks, Evalu-ating the Risks to the Schedule: PERT, Importance of Risk, Types Of Risk, Risk Iden- tification Techniques, Project Risk and Change Management [TB1: Ch. 7]
12. Risk Control, RMMM, Configuration Management & Maintenance, Environment for Configuration Control, Configuration Control vs. Version Control [TB1: Ch. 7, OLM]
13. Resource Allocation: Nature of Resources, Identifying Resource Requirements, Schedul-ing Resources, Resource Scheduling Techniques[TB1: Ch. 8]
14. Monitoring & Control: Creating Framework, Collecting Data, Visualizing Progress, Cost Monitoring, Earned Value, Change Control [TB1: Ch. 9]
15. Review and Evaluation: DeTermining Satisfaction of Requirements, Reviewing And Evaluating Performance, Project Closure: Project Documentation, Cutover/Migration, Quality Standards, Project Closing. [TB2]
16. ChallengesofOutsourcinginProjectManagement,Presentations

TeachingMethodology:

Lectures,WrittenAssignments,SemesterProject.

CourseAssessment:

SessionalExam,HomeAssignments,Quizzes,Project,FinalExam

ReferenceMaterials:

1. SoftwareProjectManagementbyBobHughesandMikeCotterell,McGraw-HillEduca- tion; 5th Edition (2009). ISBN-10: 0077122798
2. AGuidetotheProjectManagementBodyofKnowledge,3rdEdition(PMBOKGuides), ISBN-13: 978-1930699458
3. AppliedSoftwareProjectManagementbyAndrewStellmanandJenniferGreene, O'Reilly Media; 1st Edition (2005). ISBN-10: 0596009488
4. SoftwareProjectSurvivalGuide(Pro--BestPractices)bySteveMcConnell,Micro-soft Press; 1stEdition (1997), ISBN-10: 1572316217
5. MasteringSoftwareProjectManagement:BestPractices,ToolsandTechniquesbyMurali K.ChemuturiandThomasM.CagleyJr.,J.RossPublishing(2010).ISBN-10: 1604270349
6. EffectiveProjectManagement:Traditional,Agile,ExtremebyRobertK.Wysocki,Wiley; 6th Edition (2011). ISBN-10: 111801619X
7. TheSoftware ProjectManager's Handbook - Principlesthat work atwork byDwaynePhil-

lips,2ndEdition,IEEEComputerSocietyPressandWileyInter-science,2004.ISBN0- 471-67420-6

ITCC-301SystemandNetworkAdministration			
CreditHours:	4(3,1)	**Prerequisites:**	OperatingSystems

CourseLearningOutcomes (CLOs):		
Attheend ofthecourse thestudentswillbeable to:	**Domain**	**BT Level***
1.Describethekeyterminologiesandtechnologiesof Systemand network administration.	C	2
2.Explaintheservicesandfunctionsprovidedbydifferentdatacen- ters.	C	2
3.IdentifyvariousOSusedtohandlesystemandnetworkadministra- tion routines.	C	3
4.Analyzethedifferent servicesofLinuxand windows.	C	3
*BT=Bloom‘sTaxonomy,C=Cognitivedomain,P=Psychomotordomain,A=Affective domain		

CourseContent:

1. Introduction toSystemAdministration,Systems,SAComponents,BuildingaSite from Scratch, Growing a Small Site, Going Global, Replacing Services, Moving a Data Center, Handling a High Rate of Office Moves, Assessing a Site .[TB1:Ch.1]
2. Server Environment (Microsoft and Linux):KnownforReliableProducts,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, and Provide Remote Console Access.). [TB1:Ch. 4]
3. ServicesandComparativeAnalysisofmostdemandedOS:ImportantAttributes,KeyFea- tures, pros and Cons. [TB1:Ch. 5]
4. LinuxInstallationandverification.[TB2:Ch1]
5. ConfiguringLocalservicesandmanagingbasicsystemissues.[TB2:Ch 8]
6. Administerusersandgroups.[TB2:Ch 5]
7. SoftwareManagement.[TB2:Ch4]
8. ManagingNetwork ServicesandNetworkmonitoringtools. [TB2:Ch11,12]
9. BootManagement andProcess Management.[TB2:Ch6]
10. IPTablesandfiltering.[TB2:Ch13]
11. Securingnetworktraffic. [TB2:Ch14,Ch15]
12. Advance Filesystemsand logs.[TB2:Ch7]
13. BashShellScripting andCommand line.[TB2:Ch 3]
14. ConfiguringServers(FTP,DNS,Apache)LAB.[TB2:Ch16,17,18]
15. ConfiguringServersCont.(DHCP,Samba,NFS)LAB.[TB2:Ch23,24]
16. ConfiguringActive Directoryon Windows Server2012LAB[TB3:Ch7]

TeachingMethodology:

Lectures,WrittenAssignments,Practicallabs,SemesterProject,Presentations

CourseAssessment:

SessionalExam,HomeAssignments,Quizzes,Project,Presentations,FinalExam
ReferenceMaterials:
1- StudyguideforPracticeofSystemandNetworkAdministrationbyThomasA.Limoncelli, Cram101; 2nd Edition (2011). ISBN-10: 1428851755. 2- LinuxAdministration:ABeginner‘s Guide, Seventh Edition7thEdition byWaleSoyinka 3- ActiveDirectory:Designing,Deploying,andRunningActiveDirectoryFifthEditionby Barian Desmond

ITCC-302WebTechnologies			
CreditHours:	3 (3,0)	**Prerequisites:**	Programming Fundamentals

CourseLearningOutcomes (CLOs):		
Attheend ofthecourse thestudentswillbeable to:	**Domain**	**BTLevel***
1.LearnbasicWWW,itsstructureandworking.	C	1
2.Describe theconstraintsthat thewebputs ondevelopers.	C	2
3.Implementbasicclientsideandserversidelanguages.	C	4
4.Design and Implement asimpleweb application.	C	4
5.Reviewanexistingwebapplicationagainstacurrentweb standard.	C	4
*BT=Bloom‘sTaxonomy,C=Cognitivedomain,P=Psychomotordomain,A=Affective domain		

CourseContent:
1. OverviewofWWW,WebPages,WebSites,WebApplications,TCP/IP,TCP/IP Application 2. Services,WebServers,WAMP,LAMP,WAMPConfiguration. 3. Introductionto HTTP, HTML&HTML5Tags, and Dynamic Web Content.[Ch.1] 4. CSSandCSS3[Ch. 18,19] 5. ClientSideProgramming:PrograminginJavaScript:Basics,ExpressionsandControl Flow[Ch. 13, 14, 15, 20] 6. JavascriptFunctions,Objects,andArrays,AccessingCSSfromJavaScript[Ch.13,14,15, 20] 7. Form Handling[Ch. 11] 8. ServerSidePrograming:Programingin PHP, [Ch.3,4] 9. PHP functionsandobjects,PHParrays[Ch.5,6] 10. IntroductionMySQL, MySQLFunctions, Normalization,Relationships[Ch.9] 11. AccessingMySQLviaPHP [Ch.10] 12. Cookies,Sessions, andAuthentication [Ch. 12] 13. Introductionto Ajax[Ch. 17] 14. IntroductiontoJQuery 15. Browsersand theDOM[W3 SchoolsTutorial] 16. Designing aSocial NetworkingSite[Ch.21]
TeachingMethodology:
Lecturing,WrittenAssignments,Project, Report Writing
CourseAssessment:
SessionalExam,HomeAssignments,Quizzes,Project,Presentations,FinalExam

ReferenceMaterials:

1. Learning PHP, MySQL, JavaScript, and CSS, A Step-by-Step Guide to Creating Dy-namic Websites By Robin Nixon, O'Reilly Media; Second Edition edition (September 3, 2012). ISBN-10: 1449319262
2. Web Technologies: A Computer Science Perspective by Jeffrey C. Jackson, Prentice Hall;1st Edition (August 27, 2006). ISBN-10: 0131856030
3. Web Technologies by Uttam Kumar Roy, Oxford University Press, USA (June 13, 2011).ISBN-10: 0198066228
4. Web Application Architecture: Principles, protocols and practices by Leon Shklar and Rich-ard Rosen, Wiley; 2nd Edition (May 5, 2009). ISBN-10: 047051860X

ITCC-403VirtualSystemsand Services			
CreditHours:	4(3,1)	**Prerequisites:**	ProgrammingFundamentals,Com-puter Networks*

CourseLearningOutcomes (CLOs):		
Attheend ofthecourse thestudentswillbeable to:	**Domain**	**BTLevel***
1:How virtualizationis changingtoday‘sIT consumption trends.	C	4
2: Implementation,ManagementandcontrolofdifferentVirtual environments	C	5
3:WindowsandLinuxbasedsystemsadministration*	C	4

*BT=Bloom‘sTaxonomy,C=Cognitivedomain,P=Psychomotordomain,A=Affective domain

CourseContent:

1. Overviewofvirtualizationtechnologyanditsapplication,Comparisonoftraditionaland virtual systems
2. OverviewofIntelx86platform
3. Parallelanddistributedsystems
4. Typesofvirtualization, Virtualization at Softwareand Hardwarelevel
5. VirtualMachinesandconfigurationofVMs:ManagingCPU,storage,networkingetcfor VMs
6. KeyfeaturesofVMs,Hypervisorsand Configuration ofVmware
7. Hyper-VandXenhypervisors
8. Types ofhypervisors: Type-1and Type-2hypervisor
9. Featuresandlimitations ofhypervisors
10. Para-virtualizationandPara-virtualizedsoftware components
11. VmwareESXi,XenandMicrosoftvirtualizationimplementationinthecontextof datacenters (lab sessions)
12. VirtualizationinCloudComputing
13. VirtualizationinIoT
14. Virtualizationsecurity: securityat hypervisor level, VMsecurity
15. Futureof Virtualization
16. Semesterproject

TeachingMethodology:
Lectures,Labs, LabsAssignments,SemesterProject, Presentations,
CourseAssessment:
SessionalExam,HomeAssignments,Quizzes,Project,Presentations,FinalExam
ReferenceMaterials:
1. VirtualizationfromDesktoptotheEnterprise,ChrisWolfandErickM.Halter,Latest Edition 2. TheDefinitiveGuideto theXenHypervisor,DavidChisnall,LatestEdition 3. WindowsServer2012Hyper-V InstallationandConfigurationGuide,AidanFinn,Michel Luescher, Patrick Lownds, 2013 4. XenHypervisorCaseStudy-DesigningEmbeddedVirtualizedIntel®Architecture Platforms 5. Handbook of Virtual Environments: Design, Implementation, and Applications(Human FactorsandErgonomics),EditedbyKayMStanney,LawrenceErlbaumAssociatesVirtual Reality Technology by GRIGORE

ITCC-407InformationTechnologyInfrastructure			
CreditHours:	3(3,0)	**Prerequisites:**	

CourseLearningOutcomes (CLOs):		
Attheend ofthecourse thestudentswillbeable to:	**Domain**	**BT Level***
1.Informationtechnologyarchitecturesincludingsoftwaresystems, hardware,operatingsystems,databases,componenttechnologies,net-working, and architecture patterns.	C	2
2.ITInfrastructureManagement.	C	3
*BT=Bloom‘sTaxonomy,C=Cognitivedomain,P=Psychomotordomain,A=Affective domain		

CourseOutline:

1. Introduction and Definition of IT Infrastructure, IT building block, process buildingblocks, Application building block, Application Platform building block, Infrastructure building block [TB1: Ch.1,2]
2. Non-functional Attributes; introduction, non-functional requirements, Availability Concepts, Calculating availability, Sources of Unavailability, Availability Patterns.
3. Performance concepts: introduction, Perceived performance, Performance during Infrastructure Design, Performance of a running system, performance pattern, Sources of Performance Metrics, Performance Pattern. [TB1: Ch.5]
4. Security Concepts: Risk Management, Cryptography, Computer Crime, Security Patterns. [TB1: Ch.6]
5. Datacentres: Introduction & History, Building Blocks, Datacentre Availability, Datacentre Security. [TB1: Ch.7]
6. Networking:BuildingBlocks,Networkvirtualization[TB1:Ch.8]
7. NetworkAvailability,NetworkPerformance, NetworkSecurity[TB1:Ch.8]

8. Storage:IntroductionandHistory,Buildingblocks,Availability,Performance,Security. [TB1: Ch.9]
9. Compute:Introduction,BuildingBlocks,Availability,Performance,Security[TB1:Ch.10]
10. OperatingSystems:Introduction,BuildingBlocks,ImplementingVariousOSs,OSavailability, OS Performance, OS Security. [TB1: Ch.11]
11. EndUserDevises:Introduction&History,BuildingBlocks,Desktopvirtualization,De- vice Availability, Performance, Security [TB1: Ch.12]
12. Infrastructurelifecycle[TB1:13]
13. Infrastructure deployment options: Introduction, Hosting options, Enterprise infrastructure deployment, Software defined data-centre, (Hyper) Converged Infrastructure, Cloud computing, infrastructure as a code [TB1:14]
14. PurchasingInfrastructureAndServices[TB:15]
15. DeployingTheInfrastructure[TB:16]
16. MaintainingTheInfrastructure,Deployingapplications,[TB:17,18]

TeachingMethodology:

Lectures,WrittenAssignments,SemesterProject,Presentations

CourseAssessment:

SessionalExam,HomeAssignments,Quizzes,Project,Presentations,FinalExam

ReferenceMaterials:

1. IT Infrastructure Architecture: Infrastructure building blocks and concepts by Sjaak-Laan, Lulu.com; 3rd edition (2017). ISBN-978-1-326-92569-7
2. IT Infrastructure and its Management by Prof Phalguni Gupta, Tata McGraw Hill Education Private Limited (October 6, 2009). ISBN-10: 0070699798
3. IT Architecture For Dummies byKalani Kirk Hausman and Susan Cook, For Dum-mies; 1st Edition (November 9, 2010). ISBN-10: 0470554231
4. Standards Policy for Information Infrastructure by Brian Kahin and, Janet Abbate, The MIT Press (August 14, 1995). ISBN-10: 026211206X
5. IT Architectures and Middleware: Strategies for Building Large, Integrated Systems by Chris Britton and Peter Bye, Addison-Wesley Professional; 2nd Edition (June 3, 2004). ISBN-10: 0321246942

ITCC-402CyberSecurity			
CreditHours:	3 (3,0)	**Prerequisites:**	

CourseLearningOutcomes (CLOs):		
Attheend ofthecourse thestudentswillbeable to:	**Domain**	**BTLevel***
1.Describe thecoreinformationassurance(IA)principles.	C	3
2.Identifythekeycomponentsofcybersecurityarchitecture.	C	3
3.Distinguish systemandapplicationsecuritythreatsandvulnerabilities.	C	3 3
4.Definetypesofincidentsincludingcategories,responsesand timelinesforresponse	C	3

*BT=Bloom‘sTaxonomy,C=Cognitivedomain,P=Psychomotordomain,A=Affective domain

CourseContent:
1- Vulnerabilitiesininformationsystem,measuringvulnerabilities.[TB1:Ch1] 2- Threatclassification,cyber securitystarts athomeandinternationalawareness.[TB1:Ch1] 3- Vulnerabilitiesintheorganization,accessauthorizationandauthentication,securityservices in wireless networks and cloud security.[TB1:Ch2] 4- Riskininformation systeminfrastructure,hardware,software,andcyberspace. [TB1:Ch3]. 5- Assets identification, resource access control and securing the assets communication. [TB1:Ch4] 6- Secureinformation system,information securitymanagement..[TB1:Ch4] 7- CybersecurityandtheCIO,databackupand archiving,cybertrainingsandcyber policy.[TB1:Ch5] 8- Buildingasecureorganization,systemaccesscontrolandcomputernetworkmanagement securely.[TB1:Ch6] 9- Personal,physical and environmental securityandbusiness continuityplanning.[TB1:Ch6] 10- CyberspaceIntrusions,ID/PSconfiguration,ID/PSmanagementandID/PSclassification. [TB1:Ch7] 11- ID/PSimplementationandoperationin organization.[TB1:Ch7] 12- Cyberspacedefense,fileprotectionapplication,PCperformanceapplications.[TB1:Ch8] 13- Protectiontools,securityanalyzer,passwordanalyzer,firewallsandemailprotection. [TB1:Ch8] 14- Cyberspaceandlaw,internationallawandcyberrelatedlaws.[TB1:Ch9] 15- Cybercrime,trendsincyberabuse,combatingcybercrime.[TB1:Ch9] 16- Cyberwarfareand homelandsecurityand distributed defense.[TB1:Ch10]
TeachingMethodology:
Lecturing,WrittenAssignments,Project, Report Writing
CourseAssessment:
SessionalExam,HomeAssignments,Quizzes,Project,Presentations,FinalExam
ReferenceMaterials:
1. CyberspaceandCybersecurity1st EditionbyGeorgeKostopoulos 2. Security+ Guide to NetworkSecurityFundamentals, Fifth Edition MarkCiampa 3. EssentialCyberSecurityHandbook KindleEditionbyNamNguyen

ITCC-406DatabaseAdministration andManagement			
CreditHours:	3(3,1)	**Prerequisites:**	DatabaseSystems

CourseLearningOutcomes (CLOs):		
Attheend ofthecourse thestudentswillbeable to:	**Domain**	**BT Level***
1.FullyunderstandtheconceptsandtechnicalissuesofDatabaseAd- ministration.	C	2
2.HavegoodunderstandingofinternalfunctionalityofDatabaseMan- agement System.	C	2
3.AdministratorHugeDatabaseimplementedin a DBMS.	C	4

4.DatabaseAdministrationtasksi.e.BackupandRecoveryandPerfor- mance Tuning of Databases.	C	4

*BT=Bloom‘sTaxonomy,C=Cognitivedomain,P=Psychomotordomain,A=Affective domain

Courseoutline:

1. Installation;SQL*Plus;OracleEnterpriseManager;DBATools.OracleArchitectural Components: Oracle Server; Oracle Instance.
2. PhysicalStructure;SGA;SharedPool;LibraryCache;DataDictionaryCache;LargePool; User Process; Server Process; Background Processes.
3. Managing an Oracle Instance: Parameter File; Creating SPFILE; Oracle Managed Files; StartupandShutdownDatabase;AlertLogFile;BackgroundTraceFile;UserTraceFile.
4. CreatingDatabaseandDatadictionary.
5. ManagingControl Files and RedoLogFiles.
6. ManagingTablespaces, OperationswithTablespaces.
7. DataFileManagement,Segments,Block.
8. ManagingUndo Data, Undo DataStatistics: ManagingTables andUsers:
9. IndexesManagement, MaintainingData Integrity, Constraints.ManagingPrivileges.
10. BasicOracleNetArchitecture:TypesofNetworks,OracleNetServices,OracleShared Server, Connection Manager, Oracle Net Connections.
11. ServerSideConfiguration:TheListenerProcess;ConfiguringListener,Sessions,Creating and Managing Listener.
12. ClientSideConfiguration:HostNamingMethod, LocalNamingMethod,NetAssis-tant, Configurations. Usage and Configuration of Oracle Shared Server.
13. BackupandRecovery,InstanceandMediaRecovery,ConfigurationofArchivelogmode, User Managed Complete Recovery
14. LoadingDataintoDatabase,TuningTools,SizingSharedPool,SizingBufferCache,I/O Issues
15. TuningRollbackSegments,Latches,RollbackSegmentTuningSharedServers,Typesof Locks, Block Efficiency, Storage hierarchy
16. AvoidingDynamicallocation,Statistics,PCTFREEandPCTUSED,MonitoringIndexUs- age.

TeachingMethodology:

Lectures,WrittenAssignments,Practicallabs,SemesterProject,Presentations

CourseAssessment:

SessionalExam,HomeAssignments,Quizzes,Project,Presentations,FinalExam

ReferenceMaterials:

1. OracleDatabase11gDBAHandbookbyBobBrylaandKevin Loney,McGraw-HillOs- borne Media; 1st Edition (December 6, 2007). ISBN-10: 0071496637
2. OracleDatabase12cDBAHandbookbyBobBryla,McGraw-Hill;(2015),ISBN-978-0- 07-179879-2
3. DatabaseAdministration: TheComplete Guideto DBA Practices and Procedures byCraig S.Mullins,Addison-WesleyProfessional;2ndEdition(October21,2012). ISBN-10: 0321822943
4. 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
5. OracleDatabase11gTheCompleteReferencebyKevinLoney,McGraw-HillOs-borne

Media;1stEdition(2008). ISBN-10:0071598758
6. Oracle Database11gRelease2PerformanceTuningTips &Techniques(OraclePress)by Rich Niemiec, McGraw-Hill Osborne Media; 1st Edition (2012). ISBN-10: 0071780262
7. Online Material URLhttp://otn.oracle.com

ContentsofInformationTechnologySupportingCourses

ITSC-201EnterpriseSystems			
CreditHours:	3 (3,0)	**Prerequisites:**	

CourseLearningOutcomes (CLOs):		
Attheend ofthecourse thestudentswillbeable to:	**Domain**	**BT Level***
1.DiscoverDemonstrateanunderstandingof theissuesinsystems useof anEnterpriseSystems package(e.g. ERP) to supportbusiness operations anddecision.	C	2
2.UnderstandthescopeofcommonEnterpriseSystemsmodules (e.g., MM, SCM, CRM, HRM, procurement).	C	3
3.Discussthechallenges associatedwithimplementingenterprisesystems andtheirimpactsonorganizations.	C	3
4.Developmodelsforselectedbusinessprocessinenterprisesystems.	C	3
*BT=Bloom‘sTaxonomy,C=Cognitivedomain,P=Psychomotordomain,A=Affective domain		

CourseContent:

1- IntroductiontoEnterprisesystemmanagement.[TB:1Ch:1]
2- BusinessProcess Managementand system integration.[TB: 1 Ch:2].
3- Architectureand PlatformofEnterprisesystems.[TB: 1Ch:3]
4- EnterpriseSystemsanddevelopmentlifecycletechnology.[TB:1Ch:4]
5- EnterpriseSystemsandBusinessProcessReengineering,implementationandstrategies. [TB: 1 Ch:5]
6- Softwareandvendorselection[TB:1 Ch:6]
7- Operationandpost-implementation.[TB:1Ch:7]
8- Programandprojectmanagement.[TB:1Ch:8]
9- Global,Ethics and securitymanagement. [TB:1 Ch:9]
10- Supplychainmanagement.[TB:1Ch:10]
11- CustomerRelationship managementand its factor.[TB: 1 Ch:11]

TeachingMethodology:

Lecturing,WrittenAssignments,Project, Report Writing

CourseAssessment:
SessionalExam,HomeAssignments,Quizzes,Project,Presentations,FinalExam
ReferenceMaterials:
1. EnterpriseSystemsforManagement2ndedition,PublishedbyPEARSON:ISBN-13:978- 0-13-214576-3 Luvai F. Motiwalla and Jeff Thompson (2011).[TB] 2. ModernERP:Select,Implement&UseToday'sAdvancedBusinessSystemsbyMarianne Bradford, lulu.com (October 19, 2009). ISBN-10: 0557012910. 3. BusinessProcessManagement:Concepts,Languages,ArchitecturesbyMathiasWeske, Springer; 2nd Ed. 2012 4. Business Process Management Common Body Of Knowledge by Yvonne LedererAntonucci, et. al., CreateSpace Independent Publishing Platform, 2009

CourseLearningOutcomes (CLOs):	

ITSC-301OperationsResearch			
CreditHours:	3(3,0)	**Prerequisites:**	None

Attheend ofthecourse thestudentswillbeable to:	**Domain**	**BT Level***
1-Usequantitiesmethodsandtechniquesforeffectivedeci- sions–making		1
2-Modelformulationandapplicationsthatareusedinsolving business decision problems.		3

*BT=Bloom‘sTaxonomy,C=Cognitivedomain,P=Psychomotordomain,A=Affective domain

CourseContent:
1. Introduction to Model Building: An Introduction to Modeling. The Seven-Step Model-Building Process. Over view of Matrices and Vectors. Matrices and Systems of Linear Equations. The Gauss-Jordan Method for Solving Systems of Linear Equations. Linear In-dependenceand LinearDependence.The Inverse ofaMatrix.Determinants.[TB1:Ch.1,2] 2. Introduction to Linear Programming: The Graphical Solution of Two-Variable Linear Pro-gramming Problems. A Work-Scheduling Problem. A Capital Budgeting Problem. [TB1: Ch.3] 3. The Simplex Algorithm and Goal Programming: How to Convert an LP to Standard Form. The Simplex Algorithm. Using the Simplex Algorithm to Solve Minimization Problems. Solving LPs with Spreadsheets. [TB1: Ch.4] 4. SensitivityAnalysis: AnAppliedApproach:AGraphical IntroductiontoSensitivityAnaly- sis. The Computer and Sensitivity Analysis. Managerial Use of Shadow Prices. [TB1:Ch.5] 5. SensitivityAnalysisandDuality:AGraphicalIntroductiontoSensitivityAnalysis.Some

ImportantFormulas.SensitivityAnalysis.SensitivityAnalysisWhenMoreThanOneParameter is Changed. Duality and Sensitivity Analysis. [TB1: Ch.6]

6. Transportation and Transshipment Problems: Formulating Transportation Problems. Finding Basic Feasible Solutions for Transportation Problems. The Transportation Simplex Method. Sensitivity Analysis for Transportation Problems. [TB1: Ch.7]
7. Network Models: Basic Definitions. Shortest Path Problems. Maximum Flow Problems. CPM and PERT. Minimum Cost Network Flow Problems. Minimum Spanning Tree Problems. The Network Simplex Method. [TB1: Ch.8]

TeachingMethodology:

Lectures,WrittenAssignments,Quizzes

CourseAssessment:

SessionalExam,HomeAssignments,Quizzes,FinalExam

ReferenceMaterials:

1-Operations Research: Applications and AlgorithmsbyWayne L. Winston. 4th Edition

ITSC-302ObjectOrientedAnalysisandDesign			
CreditHours:	3(3,0)	**Prerequisites:**	None

CourseLearningOutcomes (CLOs):		
Attheend ofthecourse thestudentswillbeable to:	**Domain**	**BT Level***
1.Describehowtoproducedetailedobjectmodelsanddesignsfrom system requirements.	C	2
2.UsethemodelingconceptsprovidedbyUML	C	2
3.Analyzeidentifyuse casesandexpand intofullbehavioral designs**.**	C	4

*BT=Bloom‘sTaxonomy,C=Cognitivedomain,P=Psychomotordomain,A=Affective domain

CourseContent:

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 andBasics,CaseStudy,AboutInception, Feasibility and Risk Analysis [TB: Ch. 1.6, 2.1-6, 3.1-2,4.1-3]
3- UnderstandingRequirements, Requirements Types, UseCase Modeling: UseCaseWriting 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&ActivityDiagram 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,DomainModel:IdentifyingBusinessClasses,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, BusinessSequence,AnalysisSequence&CollaborationDiagrams[TB:Ch. 11.10, 12.9, 13.1-2, 13.9, 15.1-7]
7- Use Case Dependencies. Analysis Use Case Diagram, Implementation of Sequence, Collaboration, Analysis Use Case Diagram [TB: Ch. 25.1-5, 15.6-7]
8- StateChartDiagramsandImplementation[TB:Ch.29.1-5,29.8,Ch.1-13,25, 29]
9- DesignPatterns:GRASP:InformationExpert,Creator,Cohesion&Coupling,Controller [Ch. 16.1-10]
10- UseCaseRealizationUsingGRASPPatterns,DesignModel: DeTermining Visibility [TB: Ch. 17.1-9, 18.1-3]
11- ModelingGeneralization,CreatingDesignClassDiagram,MappingData ModeltoDomain Model [TB: Ch. 26.1-7, 27.1-10, 19.1-6, 34.5-9]
12- ImplementationofDesignClassDiagram,Codingpatterns,Mapping Design to Code [TB: Ch. 19.6, 20.1-11]
13- More Patterns for Assigning Responsibilities, Polymorphism, Pure Fabrication, Indirection, ProtectedVariation.GoFDesignPatterns:Adapter,Factory[TB:Ch.22.1-4,23.1- 2]
14- Gof:Singleton,Strategy,Composition,FaçadeandDiscussRemainingPatterns[TB:Ch. 23.4-8]

TeachingMethodology:

Lectures,WrittenAssignments,SemesterProject,Presentations

CourseAssessment:

SessionalExam,HomeAssignments,Quizzes,Project,Presentations,FinalExam

ReferenceMaterials:

1- Applying UML and patterns: An introduction to Object-Oriented Analysis and Design and Iterative Development by Craig Larman, Prentice Hall; 3rd Edition (October 30,2004). ISBN-10: 0131489062
2- Fundamental of Object-Oriented Design inUMLbyMeilerPage-Jones,Addison Wesley, 2000. ISBN: 020169946X.
3- TheUnifiedModelingLanguageUserGuidebyG.Booch,J.RambaughandI.Jakob son, Addison-Wesley Professional; 2nd Edition (2005). ISBN-10: 0321267974

ITSC-303OptimizationTechniques			
CreditHours:	3(3,0)	**Prerequisites:**	

CourseLearningOutcomes (CLOs):		
Attheend ofthecourse thestudentswillbeable to:	**Domain**	**BT Level***
1-Thecourseprovidesstudentsanexposuretosolvingnon-linearoptimi- zation problems by various techniques, with due emphasis on their mathematicalrigorintermsoftheirderivation/ justification.	C	1
*BT=Bloom‘sTaxonomy,C=Cognitivedomain,P=Psychomotordomain,A=Affective domain		

CourseContent:

1- Preliminaries: Review of the theory of maxima, minima (two variables); positive definite matrices, convexity of regions and functions; quadratic function and Hessian matrix; uniqueness of minimum. [TB2: Chapt. 9, Chapt. 11 : Sec.11.1 – 11.5]
2- Classical methods for functions of one variable and *n* variables, Newton's method [TB1: Chap. 1].

UnconstrainedOptimization:

3- Search methods for functions of one variable: Single search techniques: Bracketing method; Quadratic and cubic interpolation; Fibonacci search; Golden-section. [TB1: Chap. 2]
4- Search methods for functions of *n* variables: method of Hooke and Jeeves, Nelder and Mead's Method. [TB1: Chap. 3]
5- Gradient methods: Davidon-Fletcher-Powell (DFP); Fletcher- Reeves, conjugate- gradient and direct- searchmethods, Newton's method, method of Steepest descent [TB1:Chap. 4].

ConstrainedOptimization:

6- Review of Lagrange multipliers technique with equality constraints; inequality constraints and slack variables; Kuhn-Tucker conditions [TB1: Chap. 5]
7- Searchmethods: modifiedHooke and Jeeves,theComplexmethod[TB1: Chap. 6].
8- Penalty-function approach to constrained optimization; equality and inequality constraints, SUMT method of Fiacccco and McCormick. [TB1: Chap. 7]

TeachingMethodology:

Lectures,Class Exercises

CourseAssessment:

MidtermExam, HomeAssignments, Quizzes,FinalExam

ReferenceMaterials:

1- Bunday,B.D.,BasicOptimizationMethods,EdwardArnoldLtd.,1984.
2- Chiang,Alpha.C.,FundamentalMethodsofMathematicalEconomics,McGraw-HillEducation; 4th ed., 2004.

ITSC-102 Digital LogicDesign			
CreditHours:	3(3,0)	**Prerequisites:**	None

CourseLearningOutcomes (CLOs):		
Attheend ofthecourse thestudentswillbeable to:	**Domain**	**BT Level***
1-Describethekeyterminologiesofdigitalcircuitoflargecomplexi- ty.	C	2
2-Explain how suchcircuits could be builtin amethodologicalway	C	2
3-AnalyzefromstartingfromBooleanlogicandapplyingasetof rigorous techniques.	C	4

*BT=Bloom'sTaxonomy,C=Cognitivedomain,P=Psychomotordomain,A=Affective domain

CourseContent:

1- Number Systems, Operations, and Codes: Decimal Numbers, Binary Numbers, Decimal-to-BinaryConversion,BinaryArithmetic,I'sand2'sComplementsofBinary, Numbers, Signed Numbers, Arithmetic Operations with Signed Numbers, Hexadecimal Numbers, Octal Numbers, Binary CodedDecimal(BCD),DigitalCodes,Error Detection and Correction Codes. [Ch. 2]
2- Logic Gates: TheInverter,TheANDGate,TheORGate,TheNANDGate,The NOR Gate, The Exclusive-OR and Exclusive-NOR Gates. [Ch. 3]
3- BooleanAlgebraandlogicSimplification:BooleanOperationsandExpressions,Laws and RulesofBooleanAlgebra,DeMorgan'sTheorem,BooleanAnalysisof Logic Circuits, Simplification Using Boolean Algebra, Standard Forms of Boolean Expressions, Boolean Expressions andTruthTables,TheKamaughMap,Karnaugh Map SOP Minimization, Karnaugh Map POS Minimization, Five-VariableKarnaughMaps. [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- FunctionsofCombinationallogic:BasicAdders,ParallelBinaryAdders,Ripple Carry versus Look-Ahead Carry Adders, Comparators, Decoders, Encoders. Code Conveners: Multiplexers (Data Selectors), Demultiplexers, Parity Generators/Checkers.[Ch. 6]
6- latches, Flip-Flops, and Timers: Latches, Edge-Triggered Flip-Flops, Flip-Flop Operating Characteristics, Flip-Flop Applications. [Ch. 7]
7- Counters: Asynchronous Counter Operation, Synchronous Counter Operation,Up/Down Synchronous Counters, Design of Synchronous Counters. [Ch. 8]
8- Shift Registers: Basic Shift RegisterFunctions,SerialIn/SerialOutShiftRegisters, Serial In/Parallel Out Shift Registers, Parallel In/Serial Out Shift Registers, Parallel In/Parallel Out Shift Registers, Bidirectional ShiftRegisters,ShiftRegisterCounters. [Ch. 9]
9- Memory and Storage: Basics of Semiconductor Memory, Random-Access Memories (RAMs), Read-OnlyMemories(ROMs),ProgrammableROMs(PROMsand EPROMs), Flash Memories. [Ch. 10]
10- Programmable Logic:FPGA[Ch.11]

TeachingMethodology:

Lectures,WrittenAssignments,SemesterProject,Presentations

CourseAssessment:

SessionalExam,HomeAssignments,Quizzes,Project,Presentations,FinalExam

ReferenceMaterials:

1- DigitalFundamentalsby Thomas L.Floyd, PrenticeHall; 9thedition(2007)
2- DigitalFundamentals:ASystemsApproachbyThomasL.Floyd,PrenticeHall;1edition (July 13, 2012)

ITSC-305DesignandAnalysis ofAlgorithms			
CreditHours:	3(3,0)	**Prerequisites:**	DiscreteStructure

CourseLearningOutcomes (CLOs):

Attheend ofthecourse thestudentswillbeable to:	**Domain**	**BT Level***
1.Studentwillbeenabletodesignalgorithmsfor problems	C	1
2.Understandingthecore logicof problem solving	C	2
3.TimeandSpaceComplexityofAlgorithm	C	2
*BT=Bloom‘sTaxonomy,C=Cognitivedomain,P=Psychomotordomain,A=Affective domain		

CourseContent:

1. Role of Algorithms in Computing, Analysing Algorithms, Designing Algorithms, Growth of Functions, Asymptotic Notation, Standard Notations and Common Functions. [TB: Ch1,2,3]
2. Divide-and-Conquer, Strassen‘s Algorithm for Matrix Multiplication, Recursion. [TB: Ch. 4]
3. Recurrences: SubstitutionMethodforSolvingRecurrences,Recursion-TreeMethodfor Solving Recurrences, Master Method for Solving Recurrences. [TB: Ch. 4]
4. Sorting and Order Statistics: Heapsort Algorithm, Priority Ques, Quicksort Algorithm, Analysis of Quicksort. [TB: Ch. 6, 7]
5. Sorting in Linear Time: Lower Bounds for Sorting, Counting Sort, Radix Sort, Bucket Sort. [TB: Ch. 8]
6. Medians and Order Statistics, BinarySearch Trees, Querying a Binary Search Tree, Insertion and Deletion. [TB: Ch. 9, 12]
7. Red-Black Trees: Properties of Red-Black Trees, Rotations, Insertion, Deletion; Minimum Spanning Trees: Introduction, Growing a Minimum Spanning Tree. [TB: Ch.12]
8. Dynamic Programming: Elements of Dynamic Programming, Longest Common Subsequence, Optimal Binary Search Trees [TB: Ch. 15]
9. Greedy Algorithms: Elements of The Greedy Strategy, Huffman Codes, Matroids and Greedy Methods, Task-Scheduling Problem. [TB: Ch. 16]
10. Elementary Graph Algorithms, Representations of Graphs, Breadth-First Search,Depth-First Search, Topological Sort. [TB: Ch. 22]
11. Single-Source Shortest Paths: The Bellman-Ford Algorithm, Single-Source Shortest Paths in Directed Acyclic Graphs, Dijkstra‘s Algorithm. [TB: Ch. 24]
12. All-Pairs Shortest Paths: Floyd-Warshall Algorithm, Johnson‘s Algorithm for Sparse Graphs. [TB: Ch. 25]
13. Maximum Flow: Flow Networks, Ford-Fulkerson Method, Push-Relabel Algorithms, Relabel-to-Front Algorithm. [TB: Ch. 26]
14. String Matching: Naive String-Matching Algorithm, Rabin-Karp Algorithm, String Matching with Finite Automata, Knuth-Morris-Pratt Algorithm. [TB: Ch. 32]

TeachingMethodology:

Lectures,WrittenAssignments,SemesterProject,LabAssignments,Presentations

CourseAssessment:

SessionalExam,HomeAssignments,Quizzes,Project,Presentations,FinalExam

ReferenceMaterials:

1- IntroductiontoAlgorithmsbyThomasH.Cormen,CharlesE.Leiserson,RonaldL.Rivest and Clifford Stein, The MIT Press; 3rdEdition (2009). ISBN-10: 0262033844
2- IntroductiontotheDesignandAnalysisofAlgorithmsbyAnanyLevitin,AddisonWesley; 2ndEdition (2006). ISBN-10: 0321358287
3- AlgorithmsinC++byRobertSedgewick(1999).ASIN:B006UR4BJS
4- AlgorithmsinJavabyRobertSedgewick,Addison-WesleyProfessional;3rdEdition(2002). ISBN-10:0201361205

ContentsofInformationTechnologyElectiveCourses

ITEC-303MobileApplicationDevelopment			
CreditHours:	3(3,0)	**Prerequisites:**	

CourseLearningOutcomes (CLOs):		
Attheend ofthecourse thestudentswillbeable to:	**Domain**	**BT Level***
1.Discussdifferentarchitectures&frameworkforMobileApplica- tion development.	C	1
2.Developmobileapplicationsusingcurrentsoftwaredevelopment environments.	C	3
3.Comparethedifferentperformancetradeoffsinmobileapplication development.	C	3
*BT=Bloom‘sTaxonomy,C=Cognitivedomain,P=Psychomotordomain,A=Affective domain		

CourseContent:

1. A LittleBackground.What It Isn‘t.AnOpenPlatformforMobileDevelopment.Native Android Applications. Android SDK Features. Introducing the Open Handset Alliance. What Does Android Run On? Why Develop for Android? Introducing the Development Framework. What Comes in the Box? [TB1: Ch 1 TB2: Ch 1].
2. Developing for Android. Developing for Mobile Devices. To-Do List Example. Android Development Tools. [TB1: Ch 2]
3. What Makes an Android Application? Introducing the Application Manifest. Using the Manifest Editor. The Android Application Life Cycle. Understanding Application PrioritiyandProcessStates.ExternalizingResources.ACloser LookatAndroidActivities. [TB1: Ch 3]
4. FundamentalAndroidUIDesign.IntroducingViews.introducingLayouts.Creating New Views. Creating and Using Menus. [TB1: Ch 4].
5. Introducing Intents. Introducing Adapters. Using Internet Resources. Introducing Dialogs. Creating an Earthquake Viewer. [TB1: Ch 5].
6. AndroidTechniquesforSavingData.SavingSimpleApplicationData.Savingand Loading Files. Databases in Android. Introducing Content Providers. [TB1: Ch 6]

7. Savingand LoadingUser Preferences, Persisting Data to Files, Creatingand UsingDatabases. [TB1: Ch 6].
8. Using Location-Based Services. Setting up the Emulator with Test Providers. Selecting a Location Provider. Finding Your Location. Using Proximity Alerts. Using the Geocoder. Creating Map-Based Activities. Mapping Earthquakes Example. [TB**1:** Ch **7**].
9. Introducing Services. Using Background Worker Threads. Let‘s Make a Toast. Introducing Notifications. Using Alarms. Using Alarms to Update Earthquakes. [TB1:Ch8]
10. Peer-to-Peer Communication. Introducing Android Instant Messaging. Introducing SMS. [TB1:Ch 9 TB4:Ch 8].
11. Accessing Android Hardware. Using the Media APIs. Using the Camera. Introducingthe Sensor Manager. Using the Accelerometer and Compass. [TB1:Ch 10].
12. AndroidTelephony.UsingBluetooth.ManagingNetworkandWi-FiConnections. Controlling Device Vibration. [TB1:Ch 10].
13. Creating Your Own Services, Establishing Communication between a Service and anActivity, Binding Activities to Services, Understanding Threading. [TB1: Ch 11].
14. Consuming Web Services Using HTTP, Accessing Web Services Using the Get Method, Consuming JSON Services, Sockets Programming. [Tb4: Ch 10].
15. Creating Your Own Services, Establishing Communication between a Service and anActivity, Binding Activities to Services, Understanding Threading. [Tb4: Ch 11] .
16. PublishingAndroidApplications,Appstore[TB4: Ch12].

TeachingMethodology:

Lecturing,WrittenAssignments,Project, Report Writing

CourseAssessment:

SessionalExam,HomeAssignments,Quizzes,Project,Presentations,FinalExam

ReferenceMaterials:

1. ProfessionalAndroidapplicationdevelopment,RetoMeier,WroxProgrammertoProgrammer, 2015.[TB]
2. iOSProgramming:TheBigNerdRanchGuide,Conway,J.,Hillegass,A.,&Keur,C.,5thEdition, 2014.
3. AndroidProgramming: TheBigNerdRanchGuides,Phillips,B.&Hardy,B.,2ndEdition,2014
4. BeginningAndroid4ApplicationDevelopmentbyWei-MengeLee,JohnWiley&Sons,2012

ITEC-401E-CommerceApplication Development			
CreditHours:	3(3,0)	**Prerequisites:**	

CourseLearningOutcomes (CLOs):		
Attheend ofthecourse thestudentswillbeable to:	**Domain**	**BTLevel***
1:Understand theconceptsand standards relatedto the discipline of E-Commerce.	C	2
2:Analyzecomplexrealworldproblemsfound in E-Commerce	C	3

*BT=Bloom‘s Taxonomy,C=Cognitivedomain,P=Psychomotor domain,A=Affective

domain

CourseContent:

1. E-Commerce: An overview of e-Commerce, Brick 'N Mortar stores vs Service-based companies, e-Commerce Models, e-Commerce popular sites: iStockphoto, WooThemes, eBay, Amazon, Play.com. [TB: Ch.1]
2. Planning an e-Commerce Framework: Designing a framework, Patterns, ModelView-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. 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. 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,andReferrals:Discountcodes,PurchasableVoucherCodes,Referrals. [TB: Ch.9]
10. Checkout:Checkoutprocessconsideration,Orderprocessreview,Authentication& Confirmation. [TB: Ch.10]
11. Taking Payment for Orders: Taking payment, Payment System, Payment gateway, TakingPayment Online, Taking payment offline. [TB: Ch.11]
12. UserAccountFeatures:UserAccountArea,ChangingDetails,Viewing&ManagingOrders. [TB: Ch.12]
13. Administration:Dashboard,ManagingProductsandCategories,ManagingOrders, Customers, Refunds, Voucher Codes, Shipping, etc. [TB: Ch.3]
14. Deploying,Security, andMaintenance,SEO.[TB: Ch.14,15]

TeachingMethodology:

Lecturing,WrittenAssignments,Project, Report Writing

CourseAssessment:

SessionalExam,HomeAssignments,Quizzes,Project,Presentations,FinalExam

ReferenceMaterials:

1. PHP5E-commerceDevelopmentbyMichaelPeacock,PacktPublishing(January20, 2010). ISBN-10: 184719964X[TB]
2. E-Commerce,KennethLaudonandCarol GuercioTraver,13thEdition,Pearson,2017.
3. PHP 5E-commerceDevelopment,MichaelPeacock,PacktPublishing,2010.
4. IntroductiontoE-Commerce,JeffreyF. Rayport,McGraw-Hill,2ndEdition,2007.
5. Electronic Commerce, GarySchneider, Course Technology; 12th Edition2016

ITEC-405MobileandWireless Networks			
CreditHours:	**3(3,0)**	**Prerequisites:**	**ComputerNetworks**

CourseLearningOutcomes (CLOs):		
Attheend ofthecourse thestudentswillbeable to:	Domain	BT Level*
1. Introductiontomobilenetworking,withanemphasisonthe mechanisms, protocols and standards	C	1
2.Understandingofthearchitectureandoperatingprinciplesof mobile and wireless networks	C	2
3.OperationsofwirelessLANs,WANsandPANs	C	2
4.Solutionsandeffectivenessofroutingschemesformobilehosts and application-level features	C	3
*BT=Bloom‘sTaxonomy,C=Cognitivedomain,P=Psychomotordomain,A=Affective domain		

CourseContent:

1.BasicsofWirelessLocalAreaNetworks:Networks LargeandSmall,WLANsfromLANs, 802.11WLANs,HiperLANandHiperLAN2,FromLANstoPANs.[TB1: Ch2]
2. Radio Transmitters and Receivers, Multiple Access Methods: Overview of Radios, Radio Components, FDMA, TDMA, CDMA, Random Access, ALOHA, Slotted ALOHA, Reservation-based ALOHA. [TB1: Ch3]
3. Radio Propagation: Radio Propagation, Mechanisms of Radio Wave Propagation, Diffraction, Scattering, Path Loss, Multipath Phenomena. [TB1: Ch4]
4. Antennas and Transmission Lines: Introduction and Antenna Characteristics, Types of Antenna. [TB1: Ch5]
5. CommunicationProtocols andModulation:BasebandData FormatandProtocol,Baseband Coding, RF Frequency and Bandwidth, Modulation, RFID. [TB1: Ch6]
6. High-Speed Wireless Data: System Types, Standards-Based and Proprietary Solutions: Fixed Networks, Nomadic Networks, Mobile Networks, Standards-Based Solutions and Proprietary Solutions, Overview of the IEEE 802.11 Standard, Overview of theIEEE 802.16Standard,10–66GHzTechnicalStandards,2–11GHzStandards,Overviewofthe IEEE 802.20 Standard. [TB1: Ch7]
7. GSM/Cellular Networks: First-Generation Analog, Second-Generation TDMA, Second-Generation CDMA, Third-Generation Systems, 4G and Beyond, LTE. [TB2: Ch10] (William Stallings Ch. 5 and from GSM to LTE book)
8. Securityin Wireless Local Area Networks: Introduction KeyEstablishment in 802.11, Anonymity in 802.11, Authentication in 802.11, Confidentiality in 802.11, Data Integrity in 802.11, Loopholes in 802.11 Security, WPA, WPA2 (802.11i). [TB1: Ch10]
9. Voice Over Wi-Fi and Other Wireless Technologies: Introduction and Ongoing 802.11 Standard Work, Wi-Fi and Cellular Networks, WiMax, VoWi-Fi and Bluetooth,VoWi-Fi

andDECT,VoWi-FiandOtherOngoing802.xWirelessProject.[TB1:Ch11]

10. MobileAdHocNetworks:MobileAdHocNetworks,PhysicalLayerandMAC,Routing in Ad Hoc Networks. [TB1: Ch12]
11. WirelessSensorNetworks:Application,PlantNetworkLayouts,PlantNetworkArchitec- ture, Sensor Subnet Selection, Functional Requirements. [TB1: Ch13]
12. ReliableWirelessNetworksforIndustrialApplications:BenefitsofUsingWireless,Issues in Deploying Wireless Systems, Wireless Formats, Wireless Mesh Networks,
13. IndustrialApplicationsofWirelessMeshNetworks[TB1: Ch14]
14. ApplicationsandTechnologies:WirelessLocalAreaNetworks(WLAN)andPAN:Blue- tooth, Zigbee, Conflict and Compatibility, Ultra-wideband Technology. [TB1: Ch15]

TeachingMethodology:

Lectures,WrittenAssignments,SemesterProject.

CourseAssessment:

SessionalExam,HomeAssignments,Quizzes,Project,FinalExam

ReferenceMaterials:

1. WirelessNetworking:KnowItAllByPraphulChandra,DanielM.Dobkin,DanBensky, Ron Olexa, David Lide, Farid Dowla: Publisher: Newnes [TB]
2. WirelessCommunications&Networks(2ndEdition)byWilliamStallings. ISBN: 0131918354. Revised in 2009.

3. WirelessNetworks:Designand IntegrationforLTE,EVDO,HSPAandWimaxbyClint Smith 3rd edition (2014). ISBN-10: 0071819835

ITEC-302 CloudComputing			
CreditHours:	3(3,0)	**Prerequisites:**	

CourseLearningOutcomes (CLOs):		
Attheend ofthecourse thestudentswillbeable to:	**Domain**	**BT Level***
1.Understandaboutfundamentalconcepts ofdistributed computing, howthesetechniquesworkinsidetoday‘smostwidely-usedcloud computing systems	C	1
2. Understandingthebasicprinciplesofclouddeploymentand Service models	C	2
3. Deployment of service models of Cloud through simulator/Vmware/Openstacketc.	C	2
*BT=Bloom‘sTaxonomy,C=Cognitivedomain,P=Psychomotordomain,A=Affective domain		

CourseContent:

1. Distributedsystems,Characteristics,Designgoals,Typesofdistributedsystems[TB2:1]
2. WhatisCloudComputing? Differentperspectives,Propertiesandcharacteristics,Benefits [TB1: Preface]
3. ServiceanddeploymentmodelsofCloudcomputing,Servicemodels:IaaS,PaaS, SaaS[TB1:2]
4. FromIaaStoPaaS,PaaSandSaaSproperties,Issues,characteristicsandImplementa- tion[TB9]
5. Modern On-Demand Computing, Amazon‘s Elastic Cloud, Amazon EC2 Service, Characteristics,AmazonSimpleDB,AmazonSimpleQueueService(AmazonSQS),Am- azon CloudFront, Amazon Elastic Block Store (EBS) [TB1:2]
6. Virtualization, From emulation to virtualization, Goals of virtualization, Types of Virtualization Hosted and Hypervisor, Server Virtualization, CPU Virtualization [TB1:4,5]
7. Memory Virtualization:Background, Virtualization Techniques: Emulated TLB, Shadow Page Tables, Hardware supported Memory Virtualization, Nested Page Tables[6]
8. VirtualizationPracticum.[TB:AppendixA]
9. Cloud Federation: Characterization and ConceptualModel, Voluntaryor independent model, Horizontal, Vertical, Hybrid model, Architectural models for cloud federation: Semantics based, Market-oriented, Reservoir, Market-oriented, Reservoir, Service oriented architecture, Conceptual Model, Segments in a Federation [TB1: 5, 7]
10. Presence in the Cloud, Presence Protocols, Leveraging Presence, Presence Enabled, The Future of Presence, The Interrelation of Identity, Presence, and Location in the Cloud, Federated Identity Management, Cloud and SaaS Identity Management, Federating Identity,Identity-as-a-Service (IaaS), Compliance-as-a-Service (CaaS), The Future of Identity in the Cloud [TB1: 5]
11. PresenceProtocols:XMPP,SIMPLE,SIP[8]
12. Privacy and Its Relation to Cloud-Based Information Systems, Privacy Risks and theCloud, Cloud Security Challenges, Software-as-a-Service Security, Security Management (People), Security Governance, Risk Management, Risk Assessment, Security Portfolio Management, Security Awareness.[TB1:6]
13. End-User Access to Cloud Computing, YouTube, YouTube API Overview, Widgets, YouTube Player APIs, The YouTube Custom Player, YouTube Data API, Zimbra, Zimbra Collaboration Suite (ZCS), Facebook, Facebook Development, Zoho, Zoho CloudSQL, DimDim Collaborations[TB1:8]
14. MobileInternetDeviceandthe Cloud,[TB1: 9]
15. Cloud,IOTand FogComputing[3,4]

TeachingMethodology:

Lectures,WrittenAssignments,SemesterProject,LabAssignments,Presentations

CourseAssessment:

SessionalExam,HomeAssignments,Quizzes,Project,Presentations,FinalExam

ReferenceMaterials:

1. Cloud Computing Implementation, Management, and Security by John W. Rittinghouseand James F. Ransome, Taylor and Francis Group, LLC (2010). ISBN 978-1-4398-0680- 7[TB]
2. Distributed Computing: Principles and Applications Book by Mei-Ling L. Liu. ISBN-13: 978-0201796445
3. InternetofThings:PrinciplesandParadigms,bookbyrajkumarbuyyaandAmirvahid

DastjerDi(Eds.),publisher:Morgankaufmann, ISBN:978-0-12-805395-9
4. https://arxiv.org/abs/1601.02752
5. https://www.vmware.com/pdf/virtualization.pdf
6. https://www.vmware.com/pdf/virtualization_considerations.pdf
7. https://www.researchgate.net/publication/270581440_Cloud_Federation_characterization_and_conceptual_model
8. https://xmpp.org/
9. Architecting the Cloud: Design Decision for Cloud Computing Service Models (SAAS, PAAS and IAAS) Publisher: Wiley India Private Limited; 2014 edition, ISBN-10: 8126550333

ITEC-404InternetofEverything			
CreditHours:	3(3,0)	**Prerequisites:**	CS-3134

CourseLearningOutcomes (CLOs):		
Attheend ofthecourse thestudentswillbeable to:	**Domain**	**BT Level***
1.Understandingthestructure ofInternetofThings	C	1
2.UnderstandthebasicprinciplesofimplementingIoTwithFogand Cloud	C	2
3.FamiliaritywithProgrammingframeworksandBigDataanalytics in real IoT Applications	C	2
*BT=Bloom‘sTaxonomy,C=Cognitivedomain,P=Psychomotordomain,A=Affective domain		

CourseContent:

1. InternetofThings:AnOverview,IoTemergence, InternetofEveryThing.[TB1:Ch1,3]
2. IoTinfrastructures:OpenSourceSemanticwebarchitectureformanagingIoTresources in Cloud. [TB1:Ch 2]
3. Device/CloudCollaborationFrameworkforIntelligenceApplicationsIoT.[TB1:Ch,3]
4. CommunicationProtocolsforIoT,NetworkLayers,TransportandApplicationlayer [TB1: Ch 1, 13]
5. FogComputing:Principles,Architectures,andApplications.[TB1:Ch4]
6. ProgrammingFrameworksforInternetofThings,EmbeddeddeviceProgramminglanguages, IoT programming languages [TB1: Ch 5]
7. VirtualizationonEmbeddedBoardsasEnablingTechnologyfortheCloudof Things[TB1: Ch 6]
8. MicroVirtualMachines(MicroVMs)forCloud-AssistedCyber-PhysicalSystems[TB1: Ch 7]
9. DesignandImplementScalable,Flexible,andopenIoTsolutionsusingWebtechnologies [TB4: Ch 1]
10. IoTdatamanagementandAnalytics:IoTandCloud,RealtimeAnalyticsinIoTandFog Computing, [TB1: Ch 8, TB2 : Ch 1]

11. AFrameworkforDistributed DataAnalysis forIoT [TB1:Ch9]
12. SecurityandPrivacyintheInternetofThings,TinyTO:Two-WayAuthenticationfor Constrained
    Devicesinthe Internetof Things [TB2:Ch 12]
13. InternetofThingsApplications,MonitoringandActuating,InternetofVehiclesandApplications[Tb1 : Ch 15, 16]
14. Cloud-BasedSmart-FacilitiesManagement,IoTServicesLifeCycle,SchedulingandResource Management, Validating Applications and use cases [TB1:Ch17]

TeachingMethodology:
Lectures,WrittenAssignments,SemesterProject,LabAssignments,Presentations
CourseAssessment:
SessionalExam,HomeAssignments,Quizzes,Project,Presentations,FinalExam
ReferenceMaterials:

2. InternetofThings:PrinciplesandParadigms1stEdition,ISBN-10:012805395X[TB]
3. BigDataAnalytics:ToolsandTechnologyforEffectivePlanning,PublishedOctober26, 2017, ISBN 9781138032392
4. https://pdfs.semanticscholar.org/2006/d0fca0546bdeb7c3f0527ffd299cff7c7ea7.pdf
5. BuildingtheWebofThings,ISBN-10:9781617292682

ITEC-420DataWarehousing			
CreditHours:	3(3,0)	**Prerequisites:**	DatabaseSystems

CourseLearningOutcomes (CLOs):		
Attheend ofthecourse thestudentswillbeable to:	**Domain**	**BT Level***
1. Understandingthestructure ofmoderndata warehouse models	C	1
2.Understand the basic principles ofdesigningtheData warehouse	C	2
3.Familiaritywith keyalgorithms forefficiencyandefficacy	C	2
*BT=Bloom‘sTaxonomy,C=Cognitivedomain,P=Psychomotordomain,A=Affective domain		

CourseContent:

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. UserRequirementAnalysis:Interviews,Glossary-basedRequirement Analysis,
5. AdditionalRequirements.[TB:Ch. 4]
6. Conceptual Modeling: Dimensional Fact Model, Events and Aggregation, Temporal Aspects,OverlappingFactShcemata,FormalizingtheDimensionalFactModel.[TB:Ch.6]
7. Conceptual Design: ER Schema-based Design, Relational Schema-based Design, XML Schema-based Design, Mixed-approach Design. Requirement-driven Approach Design. [TB: Ch. 6]
8. WorkloadandDataVolume [TB1:Ch. 7]
9. LogicalModeling:MOLAPandHOLAPSystems,ROLAPSystems,Views,Temporal Scenarios. [TB1: Ch. 8]
10. LogicalDesign: FromFactSchematatoStartSchemata,ViewMaterialization,View Fragmentation. [TB1: Ch. 9]
11. Data-stagingDesign:PopulationReconciledDatabases,CleansingData,PopulatingDimensional Tables, Populating Fact Tables, Populating Materialized View IndexesfortheDataWarehouse:B*-TreeIndexes,BitmapIndexes,ProjectionIndex-es, Join & Star Indexes, Spatial Indexes, Join-Algorithm. [TB1: Ch. 11]
12. PhysicalDesign:Optimizers, IndexSelection,SplittingaDatabaseintoTablespaces,Allocating Data Files, Disk Block Size. [TB1: Ch. 12]
13. DataWarehouseProjectDocumentation:DataWarehouseLevels,DataMartLevel,Fact Level
14. CaseStudies,Tools forData Warehousing:MSSQLandTeradata

TeachingMethodology:

Lectures,SemesterProject,Assignments,Presentations

CourseAssessment:

SessionalExam, Assignments,Quizzes, Project,Presentations, FinalExam

ReferenceMaterials:

1. Data Warehouse Design: Modern Principles and Methodologies by Matteo Golfarelli and Stefano Rizzi, McGraw-Hill Osborne Media; 1st Edition (2009). ISBN-10: 0071610391
2. Building the Data Warehouse by William H. Inmon, Wiley; 4th Edition (2005). ISBN-10: 0764599445
3. 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
4. Data Warehousing Fundamentals for IT Professionals byPaulraj Ponniah, Wiley; 2nd Edition (2010). ISBN-10: 0470462078
5. • 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

ITEC-406SemanticWeb			
Credit Hours:	3 (3,0)	**Prerequisites:**	

Course LearningOutcomes(CLOs):		
Havingsuccessfullycompletedthis course,thestudentwillbeable to:	**Domain**	**BTLevel***

1- Understand the concept structure of the Semantic Web technology andhowthistechnologyrevolutionizestheWorldWideWebandits uses. 2- Understand the concepts of metadata, semantics of knowledge and resource,ontology,andtheirdescriptionsinXML-basedsyntaxand web ontology language (OWL). 3- Describelogicsemantics andinferencewith OWL. 4- Understand Semantic Web querylanguages(SPARQL). 5- Useontologyengineeringapproaches in semanticapplications. 6- Programsemantic applicationswith JavaandJenaAPI.		3 3 3 2 3 3

Course Content:
1- SemanticWeb–Introduction and Vision , Structured WebDocuments 2- XML,RDF, RDF-S,Web Ontology Language 3- WL,OntologyEngineering(Protégé),DiscoveringInformation 4- Querying(SPARQL)SemanticWebApplications(E-learning,Webservices) 5- DescriptionLogicReasoning(Fact++);Rules(SWRL)BuildingSemanticWebApplica- tions (Apache Jena Framework) 6- BuildingSemanticWebApplications 7- State-of-the-artinSemantic Webcommunity(Linkeddata andapplications)
TeachingMethodology:
Lecturing,WrittenAssignments, Project,
Course Assessment:
SessionalExam,HomeAssignments,Quizzes,Project,Presentations,FinalExam
ReferenceMaterials:
1. ASemanticWebPrimerthirdeditionGrigorisAntoniou,PaulGroth,FrankvanHarmelen, Rinke Hoekstra[TB] ISBN:0262018284 9780262018289 2. TheSemanticWeb:AGuidetotheFutureofXML,WebServices,andKnowledgeManage- ment by Michael C. Daconta Leo J. Obrst and Kevin T. Smith 3. Explorer‘s Guide to the Semantic WebbyThomasB.Passin

ITEC-407KnowledgeManagement			
CreditHours:	3(3,0)	**Prerequisites:**	None

CourseLearningOutcomes (CLOs):		
Atthe endofthecourse thestudents willbeable to:	**Domain**	**BT Level***
1.Appraisecurrent thoughtonknowledgemanagementinthelight of	C	2

contemporarydebatesonknowledgeproductivity,strategiccapabil- ity and organizational learning.		
2.Applytheoriesofknowledgemanagementrelevanttocurrentwork- place practice.	C	3
3.Applythe toolsandtechniquesofknowledgemanagement.	C	3
***BT=Bloom'sTaxonomy,C=Cognitivedomain,P=Psychomotordomain,A=Affectivedomain**		

CourseContent:

1- History and paradigms of knowledge management; Types of knowledge: Explicit Knowledge, Tacit Knowledge, Embedded Knowledge, Embroiled knowledge, Embod- ied knowledge, Encoded knowledge, Encultured knowledge; Organizational Internal & ExternalKnowledge;Managers'Knowledge;Personalknowledge.KnowledgeEconomy: Knowledge Revolution, Globalization, Knowledge Economy, Knowledge Workers, Knowledge Artifacts, Knowledge Agents; Knowledge Management: Definitions, Knowledge management Cycles, Benefits of KM, Implications for KM, KM Core Competencies. [TB1: Ch. 1, 2, 4]

2- KM Processes: Knowledge Discovery/ Detection, Knowledge Capture and Codification, Knowledge Organization, Knowledge Sharing, ExplicitKnowledgeSharing,Knowledge transfer, Knowledge Acquisition, Knowledge Verification, Knowledge Uti- lization, Knowledge Creation, Knowledge Reuse; [TB1: Ch. 3]

3- KM Frameworks and Models: The SECI Model, Alen Frost's Model, Boisot's KM Mod- el, Hedlund's KM Model, Earl's KM Model, Carayannis's KM Model, Wiig's KM Mod- el, Edvinsson's Model of Intellectual Capital, Snowden's KM Model, Inkpen&Dinur'sKM Model. [TB1: Ch. 4]

4- KM Frameworks and Models: Van Buren's Model of IC Management, Bukowitz& Wil- liams's KM Model, Gamble & Blackwell's KM Model, Demerest's KM Model, Frid'sKM Model, Stankosky&Baldanza's KM Framework, Kogut& Zander's KM Model, Bo- tha et. al. KM Model, Integrated Knowledge Management Model. [TB1: Ch. 4]

5- KnowledgeCaptureandCodification:TacitKnowledgeCaptureatthe Individual,Group, and Organizational Levels, xplicit Knowledge Codification, Cognitive Maps, De- cision Trees, Knowledge Taxonomies, The Relationships among Knowledge Manage- ment, Competitive Intelligence, Business Intelligence, and Strategic Intelligence; Strate- gicand 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 Respon- sibilities 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 Cul- ture, 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 Crea- tion Tools, Data Mining and Knowledge Discovery, Blogs, Mashups, ContentManage-

ment 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, KnowledgeAudit,Gap Analysis,TheKMStrategyRoadMap,Balancing Innovationand 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 OrganizationalMemory, 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 andResponsibilitieswithinOrganizations, The KM Profession,TheEthics ofKM. [TB2: Ch. 12]

TeachingMethodology:

Lectures,WrittenAssignments,Presentations

CourseAssessment:

SessionalExam,HomeAssignments,Quizzes,Presentations,FinalExam

ReferenceMaterials:

1. Essentials of Knowledge Management: Concepts, Theories and Practices byM. A. Pasha & S. Pasha, Innovators Knowledge Services (2012).ISBN:978-969-9791-04-8
2. Knowledge Management In Theory And Practice by KimizDalkir, The MIT Press; 3nd Edition (March 4, 2011). ISBN-10: 0262015080
3. The Knowledge Management Toolkit: Orchestrating IT, Strategy, and Knowledge Platforms by AmritTiwana, Prentice Hall; 2nd Edition (August 29, 2002). ISBN-10: 013009224X
4. Principles of Knowledge Management: Theory, Practice and Cases by ElieGeisler and NilminiWickramasinghe, M.E.Sharpe (January 15, 2009). ISBN-10: 0765613220
5. Knowledge Management: Concepts, Methodologies, Tools and Applications (6-volume set) by Murray E. Jennex, IGI Global; Reprint Edition (August 10, 2007). ISBN-10: 1599049333

ITEC-304Network Design andManagement			
CreditHours:	3(3,0)	**Prerequisites:**	None

CourseLearningOutcomes (CLOs):		
Attheend ofthecourse thestudentswillbeable to:	**Domain**	**BT Level***
4.**Describe**the importanceof networkdesign topdown approach.	C	2
5.**Explain**the matrices necessarytoaccomplish best networkdesign.	C	2

6.**Identify**variousinternetworkingdevicesandprotocols,andtheir functions in a network.	C	3
7.**Analyze**workingandperformanceofkeytechnologiesinnetwork design.	C	3
8.**Build**ComputerNetworkonthebaseofnetworkdesignbestprac- tices	P	3

*BT=Bloom‘sTaxonomy,C=Cognitivedomain,P=Psychomotordomain,A=Affective domain

CourseContent:

1. Analyzing Business Goals and Constraints: Using a Top-Down Network Design Methodology,AnalyzingBusinessGoals,AnalyzingBusinessConstraints.Analyzing Technical Goals and Tradeoffs: Scalability, Availability, Network Performance, Security, Manageability, Usability, Adaptability, Affordability, Making Network Design 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 NetworkTopology: Hierarchical Network Design,RedundantNetworkDesign Topologies, Modular Network Design, Designing a Campus Network Design Topology, Virtual LANs, WirelessLANs, Redundancy andLoadSharinginWired 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 AssigningNetworkLayer Addresses, Designing a Model for Naming. [TB1: Ch. 6]
5. Selecting Switching and Routing Protocols: Making Decisions as Part of the Top Down NetworkDesignProcess,SelectingSwitchingProtocols,SelectingRoutingProtocols, 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 CampusNetworks:LANCablingPlantDesign,LANTechnologies,SelectingInternetworkingDevices 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, SelectingRemote-AccessDevicesforanEnterprise,WANTechnologies, Example of a WAN Design. [TB1: Ch. 11]
10. Testing Network Design: Using Industry Tests, Building and TestingaPrototype Network System,WritingandImplementingaTestPlanforNetworkDesign,Tools for Testing a Network Design. [TB1: Ch. 12]
11. Optimizing Network Design: Optimizing Bandwidth Usage with IP Multicast Technologies, ReducingSerializationDelay,OptimizingNetworkPerformancetoMeet Quality of Service Requirements, Cisco IOS Features for Optimizing Network Performance. DocumentingNetworkDesign:RespondingtoaCustomer_sRequestfor Proposal, Contents of a Network Design Document [TB1: Ch. 13, 14].

TeachingMethodology:

Lectures,WrittenAssignments,SemesterProject,Presentations
CourseAssessment:
SessionalExam,HomeAssignments,Quizzes,Project,Presentations,FinalExam
ReferenceMaterials:
1. Top-DownNetworkDesignbyPriscillaOppenheimer,CiscoPress;3rdEdition(September 3, 2010). ISBN-10: 1587202832 (TB1) 2. NetworkingSystemsDesignandDevelopmentbyLeeChao,CRCPress;1stEdition (December 21, 2009). ISBN-10: 142009159X (TB2) 3. Networks:DesignandManagementbyStevenKarris,OrchardPublications(August2002). ISBN-10: 0970951140 4. NetworkDesign:ManagementandTechnicalPerspectivesbyTeresaC.Piliourasand KornelTerplan, CRC Press (August 19, 1998). ISBN-10: 0849334047

ITEC-409BusinessIntelligenceand Analytics			
CreditHours:	3(3,0)	**Prerequisites:**	None

CourseLearningOutcomes (CLOs):		
Attheend ofthecourse thestudentswillbeable to:	**Domain**	**BT Level***
1. Enhancestudents‘understandingregardingtheevolution,need and benefits of business intelligence.	C	2
2.StudentswillalsolearnaboutvarioustechnicalaspectsofBIand understandtheprocessesinvolvinginplanning,designing,building andmaintaining BIenvironment.	C	2
*BT=Bloom‘sTaxonomy,C=Cognitivedomain,P=Psychomotordomain,A=Affective domain		

CourseContent:

1. Business Intelligence - An Introduction, Value Drivers, Performance Metrics and Key Performance Indicators, Use Cases for BI. [TB: Ch. 1, 2]
2. BI Success Factors. Strategic Versus Tactical Planning, BI Strategy and Plan. [TB: Ch. 3,4]
3. BIEnvironment,BIandAnalyticsPlatformandStrategy,OrganizationalBIFrame- work, Services & Systems Evaluation. [TB: Ch. 5]
4. Business Process and Information Flow: Information Need & Flow, Information Pro-cessing & 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 Suit-ability. [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 Impactsof Data Flow, Dimensions of Data Quality, Data Quality Assessment, Data Quality Rules, Data Quality Monitoring and Improvement, Data Quality for Business Analyt- ics, 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.

TeachingMethodology:

Lectures,WrittenAssignments,SemesterProject,LabAssignments,Presentations

CourseAssessment:

SessionalExam,HomeAssignments,Quizzes,Project,Presentations,FinalExam

ReferenceMaterials:

1. BusinessIntelligencebyDavidLoshi,MorganKaufmann;2ndEdition(October31, 2012). ISBN-10: 0123858895 [TB]
2. OracleBusinessIntelligence11gDevelopersGuidebyMarkRittman,McGraw-HillOsborne Media; 1st Edition (September 18, 2012). ISBN-10: 0071798749
3. DeliveringBusiness IntelligencewithMicrosoftSQLServer20123/EbyBrianLarson, McGraw-Hill Osborne Media; 3rd Edition (March 16, 2012). ISBN-10: 0071759387
4. BusinessIntelligencebyElizabethVitt,MichaelLuckevich,andStaciaMisner,Micro- soft Press (December 22, 2008). ISBN-10: 073562660X

ITEC-410DataMining			
CreditHours:	3(3,0)	**Prerequisites:**	

CourseLearningOutcomes (CLOs):		
Attheend ofthecourse thestudentswillbeable to:	**Domain**	**BT Level***
1.Understandingthe structureofmoderndata mining models	C	1
2. Understandthebasicprinciplesofimplementingdatamining models	C	2
3.Familiaritywith keyalgorithms forefficiencyandefficacy	C	2
*BT=Bloom‘sTaxonomy,C=Cognitivedomain,P=Psychomotordomain,A=Affective domain		

CourseContent:

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: Chi Merge 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 Perceptron‘s, Competitive Networks and Competitive Learning, SOMs. [TB1: Ch.7]
8- Ensemble Learning: Ensemble-Learning Methodologies, Combination Schemes for Multiple Learners, Bagging and Boosting, Ada Boost. [TB: Ch. 8]
9- Cluster Analysis: Clustering, Similarity Measures, Agglomerative Hierarchical Clustering, Partitional Clustering, Incremental Clustering, DBSCAN Algorithm. BIRCH Algorithm, AgglomerativeHierarchalandPartitionClusteringAlgorithms,ClusteringValidation.[TB: Ch. 9]
10- Association Rules: Market-Basket Analysis, Algorithm Apriori, From Frequent Item-setsto 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, HITSC and LOGSOM Algorithms, Mining Path–Traversal Patterns, PageRank Algorithm, Text Mining, Latent Semantic Analysis. [TB: Ch. 11]
12- Genetic Algorithms: Fundamentals of GAs, Optimization UsingGAs, 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 FuzzyRelations, FuzzyLogic and FuzzyInferenceSystems, Multifactorial Evaluation, Extracting Fuzzy Models from Data, Data Mining and FuzzySets
14- VisualizationMethods:PerceptionandVisualization,ScientificVisualizationandIn-

formationVisualization,ParallelCoordinates,RadialVisualization,VisualizationUsing Self-Organizing Maps, Visualization Systems for Data Mining
15-Data MiningTools:Weka,CBAandYale, etc.

TeachingMethodology:

Lectures,SemesterProject,Assignments,Presentations, Interactive sessions

CourseAssessment:

SessionalMarks(Assignments,Quizzes,Project,Presentations),MidExam,FinalExam

ReferenceMaterials:

1. Data Mining: Concepts, Models, Methods, and Algorithms by Mehmed Kantardzic, Wiley-IEEE Press; 2nd Edition (August 16, 2011). ISBN-10: 0470890452 ReferenceMaterial:
2. DataMining:Concepts andTechniques,ThirdEdition(TheMorganKaufmannSeriesin Data Management Systems) by Jiawei Han, Micheline Kamber and Jian Pei, Morgan Kaufmann; 3rd Edition (2011). ISBN-10: 0123814790
3. 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
4. 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
5. Information-StatisticalDataMining:WarehouseIntegrationwithExamplesofOracle Basics(TheSpringer InternationalSeriesinEngineeringandComputerScience)byBon K.Syand ArjunK., Springer; 1stEdition (2003). ISBN-10: 1402076509
6. Building the Data Warehouse by William H. Inmon, Wiley; 4th Edition (2005). ISBN-10: 0764599445**C**

ITEC-411EnterpriseResource Planning			
CreditHours:	3(3,0)	**Prerequisites:**	None

CourseLearningOutcomes (CLOs):		
Attheend ofthecourse thestudentswillbeable to:	**Domain**	**BTLevel***
1.LearnERPtechnologies	C	2
2.HowtoimplementERPprocessestobusiness	C	2
3.AuditingERP	C	2

*BT=Bloom‘sTaxonomy,C=Cognitivedomain,P=Psychomotordomain,A=Affective domain

CourseContent:

1. Introductionto Enterprise ResourcePlanningSystems. [TB. Ch.1]
2. ERP Technology.[TB.Ch.2]
3. ERP andBusinessProcessReengineering.[TB.Ch.3]

4. SystemsDiagrammingandtheProcessMap. [TB.Ch.41]
5. ERPLifeCycle: Planningand PackageSelection.[TB. Ch.5]
6. ERPLifeCycle:ImplementationandOperationandMaintenance.[TB.Ch.6]
7. ERP Sales,CRMandKnowledgeManagement.[TB.Ch.7]
8. ERP Financials.[TB.Ch.8]
9. HumanCapitalManagement,Self-Service andOutsourcing.[TB.Ch.9]
10. Casestudies

TeachingMethodology:

Lectures,Labs, LabsAssignments,SemesterProject, Presentations,

CourseAssessment:

SessionalExam,HomeAssignments,Quizzes,Project,Presentations,FinalExam

ReferenceMaterials:

1. ModernERP:Select,Implement&UseToday'sAdvancedBusinessSystemsbyMarianne Bradford, lulu.com (October 19, 2009). ISBN-10: 0557012910.
2. ManagerialIssuesofEnterpriseResourcePlanningSystemsbyDavidOlson,McGraw-Hill/Irwin; 1st Edition (September 10, 2003). ISBN-10: 0072861126
3. EnterpriseResourcePlanningbyBretWagnerbyEllenMonk,CourseTechnology;3rd Edition (February 4, 2008). ISBN-10: 1423901797
4. ERPSystemsbyAartiBatra,IKInternationalPublishingHouse(February15,2010).ISBN- 10: 9380578148

ITEC-412NetworkProgramming			
CreditHours:	3(3,0)	**Prerequisites:**	ProgrammingFundamentals

CourseLearningOutcomes (CLOs):		
Attheend ofthecourse thestudentswillbeable to:	**Domain**	**BTLevel***
1:Identifyanddescribethepurposeofeachcomponent of the TCP/IP protocol suite	C	4
2:Learntodeveloplargeandcomplexclient-serverapplications using TCP/IP	C	5
3**:** Learn socket programming in Linux and Windows environmentdevelopingclient/serverapplicationsusingC language	C	4

*BT=Bloom‘sTaxonomy,C=Cognitivedomain,P=Psychomotordomain,A=Affective domain

CourseContent:

1. IntroductionandTCP/IP:ASimpleDaytimeClient,ProtocolIndependence,Roadmapto Client/Server [CH.1]
2. BSDNetworking,Unixstandard,64-bitArchitectures.[Ch.1]
3. TransportLayerdetails:UDP,TCP,SCTP,connections,portnumbers,buffersetc[Ch.2]
4. SocketsIntroductionandElementaryTCPSockets:SocketAddressStructure,Argu-ments and Functions [Ch.3]

5. TCP/IP client server Application [Ch.3] 6. I/OMultiplexing:TheSELECTand POLLfunction withallaspects.[Ch.6] 7. SocketOptions: getsockoptand setsockoptfunctions, default[Ch. 7] 8. Socketstates,generic,IPv4,IPv6,ICMPv6socketoptionsetc.[Ch.7] 9. ElementaryUDPSockets:sendtoandrecvfromfunctions,UDPechoserverandclient, summary of UDP. [Ch. 8] 10. ElementaryName and Address Conversions. [Ch.9] 11. IPv4andIPv6Interoperability.[Ch.10] 12. DaemonProcessesandadvancedI/O functions.[Ch.12,13] 13. Non-blockingI/Oandioctl operations.[Ch.15,16] 14. RoutingSockets,Broadcasting,Multicasting.[Ch.17,18, 19 15. Threadsand RawSockets [Ch. 23,25] 16. Datalink Access&Streams [Ch. 26, 33]
TeachingMethodology:
Lectures,Labs, LabsAssignments,SemesterProject, Presentations,
CourseAssessment:
SessionalExam,HomeAssignments,Quizzes,Project,Presentations,FinalExam
ReferenceMaterials:
1- UNIXNetworkProgrammingVolumeIbyRichardSteven,PrenticeHall; 2ndEdition(September 4, 1998).ISBN-10: 0130810819 2- WindowsSystemProgrammingbyJohnsonM.Hart,Addison-WesleyProfessional;4th Edition (February 26, 2010). ISBN-10: 0321657748 3- TheLinuxProgrammingInterface:ALinuxandUNIXSystemProgrammingHand-bookby Michael Kerrisk, No Starch Press; 1st Edition (October 28, 2010). ISBN-10: 1593272200 4- LinuxKernelDevelopmentbyRobertLove,Addison-WesleyProfessional;3rdEdition(Ju- ly 2, 2010). ISBN-10: 0672329468 5- SystemSoftware:AnIntroductiontoSystemsProgrammingbyLelandL.Beck,AddisonWes- ley, (3rd Edition) (1996). ASIN: B0084YEEWO

ITEC-413InformationSystemsand Audit			
CreditHours:	3(3,0)	**Prerequisites:**	CMP-3450(DatabaseSystems)

CourseLearningOutcomes (CLOs):		
Attheend ofthecourse thestudentswillbeable to:	**Domain**	**BTLevel***
CLO-1:Understandthe conceptsand standardsrelated tothe disciplineofInformationSystemAudit.	C	1
CLO-2:AnalyzeandAuditInformationSystems	C	4
*BT=Bloom‘sTaxonomy,C=Cognitivedomain,P=Psychomotordomain,A=Affective domain		

CourseContent:
1. IntroductiontoAuditing,AssuranceandInternalControl:DifferentTypesofAudit,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,ITStrategicPlanning,Policies,Processes,Procedures,andStandards,RiskMan-

agement. ITManagementPractices.[TB2:Ch.2]

3. OrganizationStructureandResponsibilities,BusinessContinuityPlanning,AuditingIT Governance. [TB2: Ch. 2]
4. TheAuditProcess:AuditManagement,ISACAAuditingStandards,RiskAnalysis,[TB2: Ch. 3]
5. InternalControls,PerforminganAudit,ControlSelf-Assessment,ImplementationofAudit Recommendations [TB2: Ch. 3]
6. ITLifeCycleManagement:BusinessRealization,ProjectManagement,TheSoftwareDevelopment Life Cycle (SDLC). [TB2: Ch. 4]
7. InfrastructureDevelopmentandImplementation,MaintainingInformationSystems,Business Processes, Application Controls. [TB2: Ch. 4]
8. AuditingtheSoftwareDevelopmentLifeCycle,AuditingBusinessControls,AuditingApplication Controls. [TB2: Ch. 4]
9. ITServiceDeliveryandInfrastructure,InformationSystemsOperations,InformationSys- tems Hardware, Information Systems Architecture and Software. [TB2: Ch. 5]
10. DisasterRecoveryPlanning,AuditingIS InfrastructureandOperations.[TB2:Ch.5]
11. InformationAssetProtection:InformationSecurityManagement,LogicalAccessControls. [TB2: Ch. 6]
12. NetworkSecurityControls,EnvironmentalControls,PhysicalSecurityControls,Auditing Asset Protection [TB2: Ch. 6]
13. Overviewof PopularMethodologies, Frameworkand Guidelines [TB2: AppendixB]
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]

TeachingMethodology:

Lecturing,WrittenAssignments,Project, Report Writing

CourseAssessment:

SessionalExam,HomeAssignments,Quizzes,Project,Presentations,FinalExam

ReferenceMaterials:

1. AuditingInformationSystems:EnhancingPerformanceoftheEnterprise,AbrahamNyirongo, Trafford, 2015.
2. Information Systems Control and Audit, Ron Weber, Dorling KindesleyPearson Education, 2014
3. CISA® Certified Information Systems Auditor All-in-One Exam Guide, Peter Gregory, 3rd Edition, McGraw-Hill Education, 2016
4. .InformationSystemsAuditingandAssurancebyJamesA.HallandTommieSingleton, South-Western College Pub; 2nd Edition (July 27, 2004). ISBN-10: 0324191995
5. CISA® Certified Information Systems Auditor All-in-One Exam Guide By: Peter Gregory, McGraw-Hill Osborne Media; 2nd Edition (August 9, 2011). ISBN-10: 0071769102
6. Information Technology Control and Audit, Third Edition by Sandra Senft and FrederickGallegos, Auerbach Publications; 3rd Edition (2008). ISBN-10: 1420065505
7. ManagingtheAuditFunction:ACorporateAuditDepartmentProceduresGuidebyMichael P.Cangemi andTommieW.Singleton,Wiley;3rdEdition(2003). ISBN-10:0471281190
8. COBIT4.1byIT GovernanceInstitute,ISACA(2007).ISBN-10:1933284722

ITEC-414RoutingAndSwitching			
CreditHours:	3(3,0)	**Prerequisites:**	**ComputerNetwork**

CourseLearningOutcomes (CLOs):		
Attheend ofthecourse thestudentswillbeable to:	Domain	BT Level*
1.Understandtheswitchingdetailsand mechanism	C	1
2.Understandingofthearchitectureandoperatingprincipleof router	C	2
3.OperationsofwirelessLANs,WANs	C	2
4.Solutionsandeffectivenessofroutingprotocolsandconfigura- tions	A	3
*BT=Bloom'sTaxonomy,C=Cognitivedomain,P=Psychomotordomain,A=Affective domain		

CourseContent:

1. Ethernet Basic: Ethernet Layer 1, Ethernet Layer 2, Switching and Bridging Logic, SPAN and RSPAN. [TB: Ch. 1]
2. VirtualLANs and VLAN Trunking: VLANs, VLAN Trunking Protocols, VLAN Trunk-ing: ISL and 802.1Q, Configuring PPPoE. [TB: Ch. 2]
3. Spanning Tree Protocol: 802.1d Spanning Tree Protocol, Optimizing Spanning Tree, Pro-tecting 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 Ac-cess. [TB: Ch. 5]
6. IP Forwarding (Routing): IP Forwarding, Muti-layer Switching, Policy Routing, Opti-mized Edge Routing and Performance Routing. [TB: Ch. 6]
7. EIGRP:BasicStates,EIGRPConvergence,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 Redistribu-tion, Router Summarization, Default Routes, Troubleshooting Complex Layer 3 Is-sues. [TB: Ch. 9]
10. FundamentalsofBGPOperations:BuildingBGPNeighborRelationships,Buildingthe 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 AreaNetwork: Point-to-Point Protocol, Frame Relay Concepts, Frame Relay Con-figuration. [TB: Ch. 15]

13. IPMulticasting:NeedofMulticasting,MulticastingIPAddresses,ManagingDistribution of Multicast Traffic with IGMP, LAN Multicast Optimizations. [TB: Ch. 16]
14. IPMulticastRouting:Basic,Dense-ModeRoutingProtocols,LAN-SpecificIssueswith PIM-DM and PIM-SM, Sparse-Mode Routing Protocols. [TB: Ch. 17]

TeachingMethodology:

Lectures,WrittenAssignments,SemesterProject.

Course Assessment:

SessionalExam,HomeAssignments,Quizzes,Project,FinalExam

ReferenceMaterials:

1. CCIERoutingandSwitchingCertificationGuide(4thEdition)byWendellOdom,Rus Healy and Denise Donohue, Cisco Press; 4th Edition
2. PacketGuidetoRoutingandSwitchingbyBruceHartpence,O'ReillyMedia(Sep-tember 3, 2011). ISBN-10: 1449306551
3. CCIERoutingandSwitchingv4.0QuickReferencebyBradEllis,JacobUecker andSte- ven Means, Cisco Press (October 4, 2010). ASIN: B00452V45O

ITEC-415BusinessProcess Management			
CreditHours:	3(3,0)	**Prerequisites:**	None

CourseLearningOutcomes (CLOs):

Atthe endofthecourse thestudents willbeable to:	**Domain**	**BT Level***
4.UnderstandthekeyTermsandconceptsinBusinessProcessMan- agement.	C	2
5.Learnaboutthemajormethodologiesandtechniquesforimplement- ing BPM.	C	2
6.LearnwhataBPMmanagementandprocess-centricorganizationis and how it works.	C	2
7.Understandthemetricsandmeasurementscriticaltomanagingpro- cesses	C	3
8.Learnhowtoidentifycritical processes.	C	3

***BT=Bloom'sTaxonomy,C=Cognitivedomain,P=Psychomotordomain,A=Affectivedomain**

CourseContent:

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 Orienta- tion, Workflow Management, Enterprise Services Computing. [TB: Ch. 2]
3. Business Process Modeling: Foundation, Conceptual Model and Terminology, Abstrac- tion Concepts, From Business Functions to Business Processes, Activity Models and Ac- tivity Instances, Process Models and Process Instances, Process Interactions, Modeling

ProcessData,ModelingOrganization,ModelingOperation,BusinessProcessFlexibility, 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]

TeachingMethodology:

Lectures,WrittenAssignments,Presentations

CourseAssessment:

SessionalExam,HomeAssignments,Quizzes,Presentations,FinalExam

ReferenceMaterials:

1. Business Process Management: Concepts, Languages, Architectures by Mathias Weske, Springer; 2nd Edition (May 3, 2012). ISBN-10: 3642286151.[TB]
2. Business Process Management Common Body Of Knowledge by Yvonne LedererAntonucci, et. al., CreateSpace Independent Publishing Platform (March 8, 2009). ISBN-10: 1442105666
3. Process Management: A Guide for the Design of Business Processes by Jörg Becker, Martin Kugeler and Michael Rosemann, Springer; 2nd Edition (January21, 2011). ISBN-10: 3642151892
4. Business Process Management, Second Edition: Practical Guidelines to Successful Implementations by John Jeston and Johan Nelis, Butterworth-Heinemann; 2nd Edition (March 24, 2008). ISBN-10: 0750686561
5. Process Management: Practical Guidelines to Successful Implementation by T.S. Malik, Global India Publications Pvt Ltd; 1st Edition (December 31, 2009). ISBN-10: 9380228368
6. Business Process Management: Practical Guidelines to Successful Implementations by John Jeston& Johan Nelis, Butterworth-Heinemann; 2nd Edition (March 24, 2008). ISBN-10: 0750686561
7. 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
8. Workflow Modeling: Tools for Process Improvement and Application Development by Alec Sharp and Patrick McDermott, Artech House; 2nd Edition (October 31, 2008).ISBN-10: 1596931922
9. Process Analysis and Improvement: Tools and Techniques by Seppanen, Marvic S., Kumar, Sameer & Chandra, Charu (2005). McGraw-Hill
10. Business Process Change: A Guide for Business Managers and BPM and Six SigmaProfessionals (The MK/OMG Press) byPaul Harmon and Business Process Trends, Morgan Kaufmann; 2nd Edition (July 27, 2007). ISBN-10: 0123741521

ITEC-416ArtificialIntelligence			
CreditHours:	3(3,0)	**Prerequisites:**	

CourseLearningOutcomes (CLOs):		
Attheend ofthecourse thestudentswillbeable to:	**Domain**	**BT Level***
1.KnowledgeofcurrentprogressesrelatedtoAI	C	1
2.IntroductionofmanyadvancessubjectstaughtatMSandPhD level	C	2
3.Introductionof game theory	C	2
*BT=Bloom'sTaxonomy,C=Cognitivedomain,P=Psychomotordomain,A=Affective domain		

CourseContent:

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

TeachingMethodology:
Lectures,WrittenAssignments,SemesterProject,LabAssignments,Presentations
CourseAssessment:
SessionalExam,HomeAssignments,Quizzes,Project,Presentations,FinalExam
ReferenceMaterials:
1. ArtificialIntelligence:AModernApproach,byRussellandNorvig,PrenticeHall. 2ndEdition. ISBN-10: 0137903952[TB] 2. ArtificialIntelligence:ASystemsApproachbyM.TimJones,JonesandBartlettPub-lishers, Inc; 1stEdition (December 26, 2008). ISBN-10: 0763773379 3. ArtificialIntelligencein the21st CenturybyStephen Lucci,DannyKopec,Mercury Learning and Information (May 18, 2012). ISBN-10: 1936420236

CMPC-402Capstone II			
CreditHours:	3	**Prerequisites:**	None

CourseLearningOutcomes(CLOs):		
Attheendofthecoursethestudentswill beableto:	**Domain**	**BTLev-el***
	C	1
*BT=Bloom‘sTaxonomy,C=Cognitivedomain,P=Psychomotordomain,A=Affectivedomain		

CourseContent:
1. DatabaseDesign 2. InterfaceDesign 3. InitialPrototype 4. Implementation 5. Testing
TeachingMethodology:
Lectures,SemesterProject,Assignments,Presentations,Interactivesessions
CourseAssessment:
SessionalMarks(Assignments,Quizzes,Project,Presentations),MidExam,FinalExam
ReferenceMaterials: