Bishop Heber College (Autonomous), Tiruchirappalli – 620 017
Department of Information Technology

Programme : B. Voc. (Information Technology)

PROGRAMME OUTCOMES

After successful completion of the B. Voc. (I. T.) Programme, the students will posses

PO No.	PROGRAMME OUTCOMES
PO1	**Disciplinary Knowledge :** Disseminate and demonstrate appropriate understanding on facts, concepts, principles theories and techniques in the disciplines of study by developing suitable applications.
PO2	**Analytical Reasoning :** Ability to analyze, synthesize and interpret domain specific facts or data accurately to determine the right course of action.
PO3	**Critical Thinking :** Critically think and develop new techniques, evaluate practices and theories by employing scientific approach to knowledge development.
PO4	**Problem Solving Skills :** Apply the acquired competencies to solve diversified real life problems related with the area of study and its interlinked fields.
PO5	**Communication Skills and Digital Literacy :** Able to communicate effectively and appropriately and be able to handle digital devices, tools and applications to accomplish professional responsibilities.
PO6	**Employability and Entrepreneurial Skills :** Possess employability skills acquired through industrial training and internships on the opted NSQF (National Skill Qualification Framework) Job Roles or exhibit entrepreneurial skills to establish own businesses.
PO7	**Team Work and Leadership Qualities :** Able to work effectively with coordinated efforts as a team and be able to facilitate and motivate the members of the team to move forward in the right direction to reach the goal or achieve the target.
PO8	**Ethical, Moral and Social Awareness :** Appreciate and embrace moral values in life and follow ethical practices in every social and professional ventures.
PO9	**Self-Directed and Lifelong Learning :** Aptitude to handle every professional or personal role independently and efficiently by diligent acquisition of knowledge and skills throughout the life.

PROGRAMME SPECIFIC OUTCOMES

After successful completion of the B. Voc. (I. T.) Programme, the students will posses

PO No.	PROGRAMME SPECIFIC OUTCOMES
PSO1	**Foundational Knowledge :** Make use of the fundamental principles of Information Technology, Computing Systems and Database Applications, Software Tools, Data Structures, Algorithms and Mathematical Aptitude to build solutions for real world problems.
PSO2	**Software Design and Application Development Skills :** Utilize the concepts of Database, Networking, Multimedia and Operating Systems to design and develop Software Applications for a variety of environments using programming languages and tools such as C, C++, Java, PHP, MySQL, Python etc. employing Software Engineering principles and practices
PSO3	**Technical Skills :** Able to work with confidence on areas of current technological developments involving Internetworking, Information Security, Mobile Computing, Distributed Computing and Internet of Things along with their standards, protocols, architectures and services.
PSO4	**Personal and Professional Attributes :** Exhibit effectiveness in communicating and promoting services and products and also be able to handle personal and professional responsibilities ethically, restricting all activities within the legal boundaries.

Department of Information Technology
Bishop Heber College (Autonomous), Tiruchirappalli – 620 017

B. Voc. (Information Technology)
(Syllabus for students admitted from 2022 – 2023 Onwards)

Features of the Programme :

- Skill Oriented Curriculum to meet the Industry Requirements.
- Curriculum Aligned to the Qualification Packs specified by the NSDC.
- Industry involvement in Training and Development of Skills.
- Academic flexibility with multiple entries and exits.
- Vertical Mobility in higher education leading to Research.
- Awarded with both the University Degree and the NSDC Partner Certification (NASSCOM) on successful completion of the Programme.
- Empowerment to become an Entrepreneur.
- Placement opportunities provided through Industry Partners.

Eligibility : 10 +2 or its equivalent in any stream

Duration	Award	NSQF Level	Credits Earned	Total Hours
1st Semester	Certificate in Information Technology	4	30	450
1st Year	Diploma in Information Technology	5	60	900
2nd Year	Advanced Diploma in Information Technology	6	120	1800
3rd Year	B. Voc. Degree in Information Technology	7	180	2700

Department of Information Technology
Bishop Heber College (Autonomous), Tiruchirappalli–620 017

B. Voc. (Information Technology)
(Programme Structure for Students Admitted from 2022 – 2023 onwards)

Semester I – NSQF Level 4
(Qualification Pack : SSC/Q0508 – Junior Software Developer)

Component	*Course Title*	Course Code	Credits	Hours per Week	MARKS		
					CIA	ESE	Total
General Component	Language – 1 (Tamil / Hindi / French)	U22TMI01	4	04	25	75	100
	Communication Skills in English – 1	U22EGI01	2	02	25	75	100
	Fundamentals of Information Technology	U21IT101	2	02	25	75	100
	Programming with C and C++	U21IT102	2	02	25	75	100
	Value and Life Oriented Education	U22VLO1:1/ U22VLO1:2	2	02	25	75	100
TOTAL (General Components)			**12**	**12**			
Skill Component	English Language Lab – 1	U22EGIP1	3	03	40	60	100
	PC Software Packages Lab	U21IT1P1	4	04	40	60	100
	C and C++ Programming Lab	U21IT1P2	5	05	40	60	100
	Project Work – 1	U21ITPJ1	6	06	20	80	100
TOTAL (Skill Components)			**18**	**18**	-		
GRAND TOTAL			**30**	**30**	-		

Semester II – NSQF Level 5
(Qualification Pack : SSC/Q0801 – Infrastructure Engineer)

Component	*Course Title*	Course Code	Credits	Hours per Week	MARKS		
					CIA	ESE	Total
General Component	Language – 2 (Tamil / Hindi / French)	U22TMI02	4	04	25	75	100
	Communication Skills in English-2	U22EGI02	2	02	25	75	100
	Java Programming & Database Management Systems	U21IT203	2	02	25	75	100
	Computer Networks	U21IT204	2	02	25	75	100
	Environmental Studies	U16EST21	2	02	25	75	100
TOTAL (General Component)			**12**	**12**			
Skill Component	English Language Lab – 2	U22EGIP2	3	03	40	60	100
	Java and DBMS Lab	U21IT2P3	5	04	40	60	100
	Computer Hardware & Networking Lab	U21IT2P4	4	04	40	60	100
	Project Work – 2	U21ITPJ2	6	06	20	80	100
TOTAL (Skill Component)			**18**	**18**	-		
GRAND TOTAL			**30**	**30**	-		

Semester III–NSQF Level 6
(Qualification Pack : SSC/Q0509 – Master Trainer for Junior Software Developer)

Component	*Course Title*	Course Code	Credits	Hours per Week	MARKS		
					CIA	ESE	Total
General Component	.NET Programming	U21IT305	3	03	25	75	100
	Data structures and Algorithms	U21IT306	3	03	25	75	100
	Digital Principles and Computer Organization	U21IT307	4	04	25	75	100
	Personal Effectiveness	U21IT308	2	02	25	75	100
TOTAL (General Components)			**12**	**12**			
Skill Component	Mathematics for Competitive Examinations–1	U21IT309	4	04	40	60	100
	.NET Programming Lab	U21IT3P5	4	04	40	60	100
	Data structures and Algorithms Lab	U21IT3P6	4	04	40	60	100
	Project Work – 3	U21ITPJ3	6	06	20	80	100
TOTAL (Skill Components)			**18**	**18**	-		
GRAND TOTAL			**30**	**30**	-		

Semester IV–NSQF Level 6
(Qualification Pack : SSC/Q0509 – Master Trainer for Junior Software Developer)

Component	*Course Title*	Course Code	Credits	Hours per Week	MARKS		
					CIA	ESE	Total
General Component	Operating System	U21IT410	3	03	25	75	100
	Mobile Computing Technologies	U21IT411	3	03	25	75	100
	Microprocessors and its Applications	U21IT412	3	03	25	75	100
	Professional Ethics and Cyber Laws	U21IT413	2	02	25	75	100
	NSS, NCC, ROTRACT, LEO CLUB etc..	U16ETA41	1	-	-	-	-
TOTAL (General Component)			**12**	**12**			
Skill Component	Mathematics for Competitive Examinations–2	U21IT414	4	04	40	60	100
	Operating System Lab	U21IT4P7	4	04	40	60	100
	Mobile Application Development Lab	U21IT4P8	4	04	40	60	100
	Project Work – 4	U21ITPJ4	6	06	20	80	100
TOTAL (Skill Component)			**18**	**18**	-		
GRAND TOTAL			**30**	**30**	-		

Semester V – NSQF Level 7
(Qualification Pack : SSC/Q0501 – Software Developer)

Component	*Course Title*	Course Code	Credits	Hours per Week	MARKS		
					CIA	ESE	Total
General Component	Programming with PHP and MySQL	U21IT515	4	04	25	75	100
	Information Security	U21IT516	3	03	25	75	100
	Principles of Marketing	U21IT517	2	02	25	75	100
	Software Engineering / Software Project Management / Software Testing	U21IT5:1 U21IT5:A U21IT5:B	3	03	25	75	100
TOTAL (General Components)			**12**	**12**			
Skill Component	Web Development Lab	U21ITP09	4	04	40	60	100
	PHP and MySQL Programming Lab	U21ITP10	4	04	40	60	100
	Information Security Lab	U21ITP11	4	04	40	60	100
	Project Work – 5	U21ITPJ5	6	06	20	80	100
TOTAL (Skill Components)			**18**	**18**	-		
GRAND TOTAL			**30**	**30**	-		

Semester VI – NSQF Level 7
(Qualification Pack : SSC/Q0501 – Software Developer)

Component	*Course Title*	Course Code	Credits	Hours per Week	MARKS		
					CIA	ESE	Total
General Component	Programming with Python	U21IT618	3	04	25	75	100
	Internet of Things	U21IT619	3	03	25	75	100
	Entrepreneurial Development	U21IT620	2	02	25	75	100
	Web Service Technologies / Open Source Technologies / Distributed Computing Technologies	U21IT6:2 U21IT6:A U21IT6:B	3	03	25	75	100
	Gender Studies	U16GST61	1	-	-	-	100
TOTAL (General Component)			**12**	**12**			
Skill Component	Multimedia Lab	U21ITP12	4	04	40	60	100
	Python Programming Lab	U21ITP13	4	04	40	60	100
	Internet of Things Lab	U21ITP14	4	04	40	60	100
	Project Work – 6	U21ITPJ6	6	06	20	90	100
TOTAL (Skill Component)			**18**	**18**	-		
GRAND TOTAL			**30**	**30**	-		

B. Voc. [Information Technology] – Semester – I

Language Course – I : fzpdpj; jkpo; (KANINI TAMIL)

COURSE CODE : U22TMI01 **HOURS PER WEEK : 4**
CREDITS : 4 **TOTAL HOURS : 60**
JOB ROLE : Junior Software Developer (NSQF Level : 4) **COMPONENT : General**

ghlj;jpd; gad;fs; (COURSE OUTCOMES)

,j;jhisf; fw;Wj;NjWk; khzth;fs; ngWk; gad;fs; tUkhW.

t. vz;	ghlj;jpd; gad;fs;	epiy	myFg; gug;G
CO1	fzpdpapd; tuyhw;wpidAk;> mtw;Ws; jkpo; nkhopapy; fzpdpapd; tsh;r;rpiag; gw;wpAk; mwpe;J nfhs;th;	K5	I
CO2	jkpo; nkhopapy; vk;.v];.Nth;L> vf;ry;> gth;gha;z;l; gad;gLj;Jtijg; gw;wpj; njhpe;J nfhs;Sth;.	K4	II
CO3	vOj;JUg; gpur;rpid tpirg;gyifr; rpf;fy;fspypUe;J xUq;Fwp vOj;jikg;igg; gad;gLj;Jk; jpwidf; fw;wpUg;gh;.	K2	III
CO4	jkpopy; cs;s nkd;nghUs;fisAk; jkpopy; jl;lr;R nra;tjpy; Vw;gLk; re;jpg;gpio> ,yf;fzg; gpiofisj; jpUj;Jk; nkd;nghUs;fisg; gw;wp mwpe;J nfhs;th;.	K2	IV
CO5	jkpo; kpd;D}y;fisAk; kpd; E}yfq;fs; gw;wpAk; mtw;wpd; gad;ghLfisAk; Ghpe;J nfhs;Sk; Mw;wy; ngw;wpUg;gh;.	K5	V

myF - 1

fzpdpapd; tuyhW - njhlf;ffhyg; gad;ghL - Kjy;> ,uz;lhk;> %d;whk;> ehd;fhk; jiyKiwf; fzpdp - fzpdpapd; mikg;G - fzpdpj; jkpo; tuyhW - fzpdpj; jkpo; tsh;r;rpapy; muR - jd;dhh;t mikg;G kw;Wk; jdpegh; gq;fspg;Gfs;.

myF - 2

jkpo; mr;Rg;gjpg;G ghpkhw;wk; - vk;. V];. Nth;L> vf;]y;> gth;gha;z;l;> - fzpdpj; jkpo; fiyr; nrhw;fs; mwpKfk; - fiyr;nrhy; gad;ghl;Lr; rpf;fy;fSk; jPh;TfSk;.

myF - 3

jkpo; tpirg;gyif mwpKfk; - gy;NtW jkpo; tpirg;gyiffs;- jkpo; vOj;JU mwpKfk; - xUq;Fwp vOj;JU mwpKfk; - gytpj tpirg;gyiffshy; Neh;e;j rpf;fy;fSk; mtw;Wf;fhd jPh;Tk; - xUq;Fwp vOj;jikg;gpd; NjitAk; mjd; epiwFiwfSk;.

myF - 4

gy;NtW jkpo; nkd;nghUs;fs; - gy;NtW jkpo; vOj;JUf;fs; - jkpo; vOj;JU khw;wp - ,yf;fzj; jpUj;jp - nrhw;gpio jpUj;jp - re;jpg;gpio jpUj;jp - jkpo; xypkhw;wp.

myF - 5

kpd; jkpo; - kpd;D}y; - kpd;D}y; tuyhWk; mjd; gad;ghLfSk; - kpd;D}y; tiffs; - kpd;D}y; cUthf;fk; - kpd; E}yfk; : mwpKfKk; gad;ghLk; - ,e;jpa kpd;D}yfk;.

ghlE}w;fs;;

1. ,y. Re;juk;> - ‘fzpdpj; jkpo;”
2. vk;. tp. vk;. Kj;J kzpfz;ld;> - ‘fzpg;nghwp mwptpay; fw;gpj;jy;”
3. kh. Md;Nlh gPl;lu;> ‘jkpOk; fzpg;nghwpAk;;”
4. Jiuaurd;> - ‘,izaKk; ,dpa jkpOk;”
5. Jiu kzpfz;ld;> - ‘jkpo;f; fzpdp ,izag; gad;ghLfs;;”

6. nghd;d itf;Nfh> - ‘,izaj; jkpo; tuyhW”
7. %. Godpag;gd;;> “,izaKk;; jkpOk;”

B. Voc. [Information Technology] – Semester – I
English Language Course – I : ENGLISH FOR COMMUNICATION - I

COURSE CODE : U22EGI01 **HOURS PER WEEK : 2**
CREDITS : 2 **TOTAL HOURS : 30**
JOB ROLE : Junior Software Developer (NSQF Level : 4) **COMPONENT : General**

COURSE OBJECTIVES :
To acquire skills of listening, reading and speaking and to understand the elements of language and establish the appropriate relationship among linguistic components.

COURSE OUTCOMES:
After the successful completion of this course, the student will be able to

CO. No.	Course Outcomes	Level	Unit
CO1	Spell out and present ideas clearly and logically to achieve the purpose of reaching out to the intended audience.	K1	I
CO2	Demonstrate their speaking ability in English both in terms of fluency and comprehensibility in the business environment catering to the business needs.	K2	II
CO3	Construct academic vocabulary and write complex sentences using accurate grammatical structures.	K3	III
CO4	Examine the sequence of sounds that are heard in a word in the correct order and infer meanings of unfamiliar words according to the context.	K4	IV
CO5	Assess the professional demands and handle the day to day affairs well with their knowledge of language proficiency.	K5	V
CO6	Develop their social and work-life skills, as well as their personal and emotional well-being, including teamwork, emotional maturity and confidence, responsibility and employability skills	K6	V

UNIT - 1
Grammar
Correction of common errors
Transformation of Sentences

UNIT - 2
Types of Communication
Reading Comprehension

UNIT - 3
Word Building
Vocabulary-I
Vocabulary-II

UNIT - 4
Notices, Agendas and Minutes
Business Correspondence

UNIT - 5
Listening Skills
Teamwork Skills
Emotional Intelligence Skills

TEXT BOOKS
1. Board of Editors, **“Synergy-Communication in English and Study Skills”**, Orient Blackswan. Pvt. Ltd., 2008.

2. G. M. Sundaravalli, A.S. Kamalakar, P. Kusuma Harinath, **"Communication and Soft Skills"**, Orient Blackswan Pvt. Ltd., 2015.
3. Bikram K. Das, **"Functional Grammar and Spoken and Written Communication in English"**, Orient Blackswan Pvt. Ltd., Kolkatta, 2006.

B. Voc. [Information Technology] – Semester – I
Core Course – I : FUNDAMENTALS OF INFORMATION TECHNOLOGY

COURSE CODE : U21IT101 | **HOURS PER WEEK : 2**
CREDITS : 2 | **TOTAL HOURS : 30**
JOB ROLE : Junior Software Developer (NSQF Level : 4) | **COMPONENT : General**

COURSE OBJECTIVES :
To understand the concepts and technologies associated with the Computer Hardware, Software, Database Management, Communication Networks, World Wide Web, Information Security, Multimedia and other recent advancements in the fields of Computing, Communication and Information Technologies.

COURSE OUTCOMES:
After the successful completion of this course, the student will be able to

CO. No.	Course Outcomes	Level	Unit
CO1	Illustrate the basic concepts of computers, classification, generations of computers and architecture of computers.	K2	I
CO2	Develop hardware, Software and Database Management system principles.	K3	II
CO3	Discover the recent advancements in the field of computing and telecommunications Internet and Intranet.	K4	III
CO4	Criticize computer Security, virtual reality and Multimedia Content Creation.	K5	IV
CO5	Recommend the techniques of Artificial Intelligence, Business Intelligence and Data warehouse in Information Technology.	K5	V
CO6	Build applications on computers in the field of education, training, science, engineering and other Recent Technologies.	K6	V

UNIT - 1
Introduction to Computer Systems: Introduction to Computers – Generations of Modern Computers – Classification of Digital Computer Systems – Anatomy of a Digital Computer – Computer Architecture – The Number System – Central Processing Unit and Memory Units – Secondary Storage Devices – Input Devices – Output Devices

UNIT - 2
Computer Software and Software Development: Introduction to Computer Software & Software Development – Programming Languages – Operating Systems – General Software Features and Trends.

UNIT - 3
Telecommunications: Introduction–Computer Networks–Communication Systems–Distributed Data Processing–**Internet and Intranets:** Internet & WWW–Overview of Electronic mail–Introduction to Intranets–Introduction to E-Commerce and E-Business–Introduction to Web Design–Overview of Web Technologies

UNIT - 4
Security: Introduction to Computer Security – Cryptography – Computer Viruses, Bombs, and Worms – **Multimedia and Virtual Reality:** Introduction to Multimedia – Multimedia and its applications – Introduction to Virtual Reality

UNIT - 5
New Technologies in Information Technology: Introduction to Hypermedia – Artificial Intelligence and Business Intelligence – Knowledge Discovery in Database – Data Warehouses and Data Marts – Data Mining and OLAP – ERP. **Applications of Information Technology:** Computers in Business and Industry – Home – Education and Training – Entertainment, Science, Medicine and Engineering – Mobile computing and Business on the Internet

TEXT BOOK

1. Alexis Leon, Mathews Leon, "**Fundamentals of Information Technology**", Second Edition, Vikas Publishing House Pvt. Ltd., Chennai, 2009.

REFERENCE BOOK

1. Reema Thareja, **"Fundamentals of Computers",** Oxford University Press, 2014.

B. Voc. [Information Technology] – Semester – I
Core Course – II : PROGRAMMING WITH C and C++

COURSE CODE : U21IT102 **HOURS PER WEEK : 2**
CREDITS : 2 **TOTAL HOURS : 30**
JOB ROLE : Junior Software Developer (NSQF Level : 4) **COMPONENT : General**

COURSE OBJECTIVES :
To acquire problem solving and programming skills with the facilities in C and C++languages.

COURSE OUTCOMES
After the successful completion of this course, the student will be able to

CO. No.	Course Outcomes	Level	Unit
CO1	Define the basic structure of program and concepts of programming languages.	K1	I
CO2	Explain the representation of Arrays, Functions, Structures and Unions	K2	II
CO3	Experiment with the usage of pointers and files	K3	III
CO4	Examine the concept of Object Oriented Programming	K3	IV
CO5	Build the object instantiation using constructors and destructors	K4	IV
CO6	Construct the hierarchy and reusability of code	K5/K6	V

UNIT - 1
Overview of C: History-Importance of C–Sample Programs-Basic Structure of C programs-Character Set–C tokens–keywords and Identifiers–Constants–Variables–Data types–Declaration of variables–Assigning values to variables–Symbolic constants.-**Operators and Expressions:** Introduction–Arithmetic Operators–Relational Operators–Logical operators–Assignment Operators–Increment and Decrement operators–Conditional operators-Bitwise Operators–Special Operators–Expressions–**Decision making and Branching:** If statement, Switch Statement – goto Statement – **Decision Making and Looping:** While – Do-while – For loop.

UNIT - 2
Arrays: One, Two and Multidimensional arrays – **Functions :** User defined functions –Mathematical and String Handling functions- Category of functions – Recursion – Scope and life time of variables in functions. - **Structures and Unions:** Introduction – Structure definition – Giving values to members – Structure Initialization – Comparison of Structure variables – Arrays of structures – Arrays within structures – Structures within structures – Structures and functions – Unions.

UNIT - 3
Pointers: Introduction – Understanding pointers – Accessing the address of a variable through input pointer – Pointer expressions – Pointer Increments and Scale factor – Pointers and Arrays – Pointers and character strings **File Management:** Introduction – Defining and opening a file – Closing a file – Input or Output operations on files – Error handling during I/O operations – Random access to files – Command line arguments. Preprocessors.

UNIT - 4
Introduction to Object Oriented Programming: OOP Paradigm - OOP Concepts – Benefits of OOP – OOP Languages – Functions in C++ - Classes and Objects – Constructors and Destructors – Operator Overloading.

UNIT - 5
Inheritance-Virtual Functions – Polymorphism – Managing Console Operations – Working with Files

TEXT BOOKS

1. E. Balagurusamy, "**Programming in ANSI C**", Tata McGraw-Hill Publishing Company Ltd.
2. E. Balagurusamy, "**Object Oriented Programming with C++**", 5th Edition, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2011.

REFERENCE BOOKS

1. Ashok N. Kamthane, "**Programming with ANSI and TURBO C**", Pearson Education, 2004.
2. Herbert Schildt, "**C++ The Complete Reference**", 5th Edition, McGraw Hill Education, 2012.

B. Voc. [Information Technology] – Semester – I

VLOE Course : VALUE AND LIFE ORIENTED EDUCATION

COURSE CODE : U22VLO1:1/ U22VLO1:2 **HOURS PER WEEK : 2**
CREDITS : 2 **TOTAL HOURS : 30**
JOB ROLE : Junior Software Developer (NSQF Level : 4) **COMPONENT : General**

COURSE OBJECTIVES :

To understand Indian culture and heritage and envisage a transformed India, to have a better insight of self-worth, to equip to face challenges and march towards implementation of personal goals, To forge and nurture healthy relationships and to appreciate and maintain the sanctity of marriage

COURSE OUTCOMES

After the successful completion of this course, the student will be able to

CO. No.	Course Outcomes	Level	Unit
CO1	Relate Indian culture and heritage to envisage a transformed India.	K2	I
CO2	Develop a better insight on self-worth.	K3	II
CO3	Examine the challenges in life and move forward to achieve personal goals.	K4	III
CO4	Perceive and nurture healthy Relationships	K5	IV
C05	Explain the concepts of Gender Sensitivity and Equality	K5	V
CO6	Create an atmosphere to appreciate and maintain the sanctity of marriage.	K6	V

UNIT - 1

Shaping "Incredible India"

Glorious past – cultural heritage and values - Present scenario – Indian constitution with respect to human values – Shaping new India

UNIT - 2

Human Values Development and Transformation of Self

Principles and values – Values of concern-three dimensions – self, interpersonal and social activities – Strategizing values – Self-identity – Self-discovery and Self-acceptance – Self-esteem – Personality development.

UNIT - 3

Life Enrichment Skills

Purpose for life – mission and vision – Goal setting- characteristics of goals - Time management – levels of time management – categories of stress – factors leading to stress - stress management

UNIT - 4

Dynamics of Interpersonal Relationships

Building relationships- types of interpersonal relationship – Hints towards improving relationships - conflict management in relationship – emotional management

UNIT - 5

Gender, Human Sexuality and Marriage

Gender concepts – gender sensitivity – human sexuality – sexually transmitted diseases - marriage – purpose – complementary responsibilities and commitment – building a happy home (do's and don'ts)

TEXT BOOK

1. **" Human Values"**, All India Association for Christian Higher Education (AIACHE), New Delhi.

B. Voc. [Information Technology] – Semester – I
English Practical Course – I : ENGLISH LANGUAGE LAB – I

COURSE CODE : U22EGIP1 **HOURS PER WEEK : 3**
CREDITS : 3 **TOTAL HOURS : 45**
JOB ROLE : Junior Software Developer (NSQF Level : 4) **COMPONENT : Skill**

COURSE OBJECTIVES :
To obtain practical training to enhance the listening, reading and speaking skills.

COURSE OUTCOMES :

CO No.	Course Outcomes	Level	Exercise
CO1	Apply different strategies for effective listening, speaking, reading and writing.	K3	1, 2
CO2	Demonstrate a comprehensive understanding of text by means of enhanced vocabulary.	K2	3
CO3	Develop the ability to assimilate thoughts, expand on ideas and provide out-of-the-box solutions.	K6	4
CO4	Develop and expand writing skills, especially writing a refined, structured paragraph with clarity and coherence.	K6	5
CO5	Develop excellent speaking skills and exhibit contextual usage of language.	K6, K2	6
CO6	Develop critical thinking by reading, processing and evaluating the given information in a language based problem to arrive at a solution.	K3,K5	7

EXERCISES

1. Tenses and Connected Speech Listening
2. Speech Sounds and Intonations
3. Spoken English in day-to-day practical context
4. Loud and Silent Reading
5. Presentations
6. Discussions
7. Conversations and Role Plays

B. Voc. [Information Technology] – Semester – I
Core Practical Course – I : PC SOFTWARE PACKAGES LAB

COURSE CODE : U21IT1P1 **HOURS PER WEEK : 4**
CREDITS : 4 **TOTAL HOURS : 60**
JOB ROLE : Junior Software Developer (NSQF Level : 4) **COMPONENT : Skill**

COURSE OBJECTIVES :
To acquire hands on training to effectively use MS-Office tools such as MS-Word, MS-Powerpoint, MS-Excel and MS-Access.

COURSE OUTCOMES
COURSE OUTCOMES
After the successful completion of this course, the students will be able to

CO No.	Course Outcomes	Level	Exercise
CO1	Create documents using MS-Word, spreadsheets using MS-Excel, presentations using MS-PowerPoint and database using MS-Access	K3	1,7,11,16
CO2	Develop table, paragraph. and operations.in Ms Word and MS Access	K3	3,4,15,17,18,19
CO3	Examine Mail Merge and Excel chart in MS. Word	K4	5,6
CO4	Determine function, data analysis and manipulation in MS. Excel	K5	8,9,10
CO5	Evaluate Master Slide, graphics and Animations in MS PowerPoint	K5	12,13,14
CO6	Test data, queries, forms and Report in Ms. Access	K6	20,21,22

MS – WORD

1. Creating Documents and Performing the Basic Operations
   (i) Cutting, copying, and Pasting text.
   (ii) Bullets and Numbering
2. Manipulating Documents
   (i) Font Type, Font Size, Font Color.
   (ii) Using Auto Shapes
   (iii)Working with Smart Art and Clip Art
3. Working with Tables
   (i) Table Background Color, Border Color, Border Style.
   (ii) Modifying Table Style, Caption.
   (iii) Merging, Splitting Columns, Inserting, Deleting Rows, Columns.
4. Working with Paragraph
   (i) Paragraph Columns, Drop Cap, Indentation and Underlining Styles.
   (ii) Inserting Pictures, Page Borders and Shading.
   (iii) Using Water mark, Header and Footer
   (iv) Implementing Document Password.
   (v) Setting Page Orientation and Margins.
5. Working with Mail Merge.
6. Employing Excel chart in Ms Word.

MS – EXCEL

7. Creating new Spreadsheet
   (i) Opening, Saving Worksheets.
   (ii) Formatting Cells.
8. Manipulate with Function
   (i) Student Mark List.
   (ii) Electricity Bill.
   (iii) Salary Bill Preparation
   (iv) Perform Sorting (Ascending, Descending, Custom.)
9. Data Analysis
   (i) Splitting Text into Cell.
   (ii) Data Filtering.

(iii) Data Validation.
(iv) Data Consolidation.

10. Data Manipulation
    (i) Usage of Dropdown Controls
    (ii) Usage of Line, Column and Pie Charts
    (iii) Importing and Exporting Text Files, Removing Duplicates

MS – POWER POINT

11. Creating a new presentation
    (i) Opening and Saving Power Point Presentations.
    (ii) Employing Header and Footer, Slide Number, Pictures
    (iii) Equation and Symbols
    (iv) Colors and Shapes
    (v) Working with Flow Charts
12. Build on Animation and Multimedia to slides
    (i) Transitions and Animations
    (ii) Creating Presentation as Slide Show and Video
    (iii) Usage of Action and Link Buttons
13. Designing the Presentation to slides
    (i) Shapes; Callouts, Stars and Banners
    (ii) Creating Master Slide
    (iii) Using Outline View
14. Applying Graphics
    (i) Employing Smart Art
    (ii) Employing Themes and Variants
    (iii) Word Art and Clip Art
15. Inserting Table using with various types of Charts into presentations

MS – ACCESS

16. Creating a new Database.
    (i) Examine different file format
    (ii) Save in a specified location.
17. Designing a table and performing Operations on table
    (i) Create a field in Design View
    (ii) Change the field properties and delete field.
    (iii) Set the Primary and Foreign Key
    (iv) Switching between the table design view and table datasheet views
    (v) Enter values to a table
18. Importing Data from External Data source
    (i) Import a table from one Database to another Database
    (ii) Import Excel data into Access table
    (iii) Modify imported table's Design
19. Defining Relationship between tables.
    (i) Create tables with required field.
    (ii) Connect table with different relationship
20. Working with Queries
    (i) Create a query using wizard (Insert, Update, Delete and Select)
    (ii) Apply Aggregate functions on table data
    (iii) Perform Logical Operations
    (iv) Perform Join Operations
    (v) Create and Modify multi table query
21. Designing a Form
    (i) Create and Split form
    (ii) Create multiple items form
    (iii) Enter Data via form
    (iv) Modify the layout of a form
22. Creating Report
    (i) Create a report using report wizard
    (ii) Modify a report view
    (iii) Change the sorting in a report
    (iv) Insert a picture in report header

(v) Add footer to a field
(vi) Set Validation Rule

B. Voc. [Information Technology] – Semester – I

Core Practical Course – II : C and C++ PROGRAMMING LAB

COURSE CODE : U21IT1P2 **HOURS PER WEEK : 4**
CREDITS : 4 **TOTAL HOURS : 60**
JOB ROLE : Junior Software Developer (NSQF Level : 4) **COMPONENT : Skill**

COURSE OBJECTIVES :
To acquire Programming experience with the facilities available in C and C++.

COURSE OUTCOMES

After the successful completion of this course, the student will be able to

CO No.	Course Outcomes	Level	Exercise
CO1	Construct the code using operators, mathematical functions with branching and looping statements	K3	1 – 10
CO2	Inspect the array of strings and functions with simple programs	K4	11 – 14
CO3	Determine the usage of structures and unions	K5	15 – 18
CO4	Interpret different operations of file processing	K5	19 , 25
CO5	Create a program to explain the concept of classes and objects using constructors and destructors	K6	20 – 22
CO6	Test the code using inheritance and overloading	K6	23 – 25

C Programming Lab

1. Develop C programs using Operators
2. Create C programs employing Mathematical functions
3. Write a C program to perform Type Conversion
4. Develop C programs employing different types of If statements
5. Create C programs using Switch Statement
6. Write a C program using Conditional Operator
7. Write a C program using Go to Statement
8. Write a C program using While Statement
9. Write a C program using Do-While Statement
10. Develop C programs employing For statements
11. Develop C programs employing Arrays
12. Create a C program to implement String Manipulations
13. Develop C programs employing Functions
14. Create a C program to implement Recursion
15. Develop C programs employing Structures
16. Develop C programs employing Arrays of Structures
17. Develop a C program employing Union
18. Develop a C program employing Array of Pointers
19. Develop C programs employing Input / Output Operations on Files

C++ Lab

1. Develop C++ programs using Classes and Objects
2. Create C++ programs using Constructors and Destructors
3. Write C++ programs to perform Function and Operator Overloading
4. Create C++ programs to implement the use of Inheritance
5. Develop C++ programs employing Virtual Functions.
6. Create C++ programs to implement File Operations

B. Voc. [Information Technology] – Semester – II

Language Course – II : ,izaKk; jkpOk; (INAIYAMUM TAMILUM)

COURSE CODE U22TMI02 **HOURS PER WEEK : 4**
CREDITS : 4 **TOTAL HOURS : 60**
JOB ROLE: Infrastructure Engineer (NSQF Level : 5) **COMPONENT : General**

ghlj;jpd; gad;fs; (COURSE OUTCOMES)

,j;jhisf; fw;Wj;NjWk; khzth;fs; ngWk; gad;fs; tUkhW.

t. vz;	ghlj;jpd; gad;fs;	epiy	myFg; gug;G
CO1	,izaj;ijg; gw;wpa mwpKfj;ijAk; ,izaj;jpy; jkpo; ngw;wpUf;Fk; ,lj;ijAk; tpsq;fpf;nfhs;th;	K3	I
CO2	kpd;dQ;ry; gw;wp mwpe;Jnfhs;tNjhL jkpo;;j; NjLnghwpfspy; jfty;fisj; jpul;Ltjw;Fk; mwpth;.	K5	II
CO3	tpf;fpg;gPbahitg; gw;wpAk; tpf;fpg;gPbahtpy; vOJk; KiwfisAk; czh;th;.	K6	III
CO4	tiyg;G+f;fspd; Njhw;wk; tsh;r;rp Fwpj;Jk; tiyg;G+f;fspy; vOJk;Kiw Fwpj;Jk; mwpe;J nfhs;th;	K6	V
CO5	,izar; Nritfisg; gw;wp mwptNjhL mjidg; gad;gLj;Jk; mwpitAk; ngWth;.	K5	V
CO6	,izaj;jjpy; gjpNtw;wf;$ba ,izag;gjpTfs; gw;wpf; njspT ngWth;	K6	VI

myF - 1

,izak; mwpKfk; - ,izaj;jpd; tuyhWk; tsh;r;rp epiyAk; - ,izag; gad;ghLk; ,d;iwa tho;tpaYk; - jkpo; ,iza tuyhW - ,izaj;jpy; jkpopd; jlk;.

myF - 2

jkpopy; jfty; ghpkhw;wk; - kpd;dQ;ry; cUthf;fKk; mjd; gad;ghLfSk; - kpd;dQ;rypd; cs;slf;fk; - ,iza ,aq;Fjsq;fs; - ,izaj;jpy; jfty; cyhTjy;> jfty; NjLjy; - jkpo;j; NjLnghwpfs; - ,izaj;jpy; juTfisg; gjptpwf;Fjy;> gjpNtw;Wjy;.

myF - 3

tpf;fpg;gPbah mwpKfk; - tpf;fpg;gPbah ngah; fhuzk; - Njhw;wk; tsh;r;rp - jkpo; tpf;fpg;gPbah - tpf;fpg;gPbah fzf;F cUthf;fk; - tpf;fpg;gPbahtpy; jFe;j rhd;whjhuq;fSld; fl;Liu vOJjy; kw;Wk; GJg;gpj;jy; - tpf;fpg;gPbahtpd; cs;slf;ff; $Wfs; - cyf nkhopfspy; jkpo; tpf;fpg;gPbah ngWk; ,lk;.

myF - 4

tiyg;G+ mwpKfk; - mjd; tsh;r;rpAk; tifg;ghLk; - jkpo; tiyg;G+f;fs; - tiyg;G+ cUthf;fk; - tiyg;G+ njhlq;Ftjw;fhd mbg;gilfs; - tiyg;G+j; jiyg;Gk; KfthpAk; - gf;f tbtikg;Gj; njhpT - tiyg;G+tpd; cs;slf;ff; $Wfs; - tiyg;G+g; gjptpLif.

myF - 5

,izar; Nritfs; mwpKfKk; mjd; gad;ghLk; - tq;fpr; NritfSf;F tpz;zg;gpj;jy; - ,uapy; gazr;rPl;L Kd;gjpT nra;jy; - Nghl;bj; Njh;TfSf;F tpz;zg;gpj;jy; - Ntiy tha;g;G mYtyfg; gjpT kw;Wk; GJg;gpj;jy;.

ghl E}w;fs;;

1. Jiu kzpfz;ld;> - ‘,izaKk; jkpOk;”
2. Jiuaurd;> - ‘,izaKk; ,dpa jkpOk;”

3. Jiu kzpfz;ld;> - ‘jkpo;f; fzpdp ,izag; gad;ghLfs;;”
4. nghd;d itf;Nfh> - ‘,izaj; jkpo; tuyhW”
5. %. Godpag;gd;;> “,izaKk;; jkpOk;”
6. n[. tPuehjd;> - ‘,izaj;ij mwpNthk;”
7. ,y. Re;juk;> - ‘fzpdpj; jkpo;”
8. Jiu kzpfz;ld;> - ‘,izaj;jpy; jkpo; tiyg;G+f;fs;”

B. Voc. [Information Technology] – Semester – II
English Language Course – II : ENGLISH FOR COMMUNICATION - II

COURSE CODE : U22EGI02 **HOURS PER WEEK : 2**
CREDITS : 2 **TOTAL HOURS : 30**
JOB ROLE : Infrastructure Engineer (NSQF Level : 5) **COMPONENT : General**

COURSE OBJECTIVES :
To acquire knowledge on English usage and discourse styles for use in day-to-day contexts and to develop the skills of thinking, evaluating and writing.

COURSE OUTCOMES:
After the successful completion of this course, the student will be able to

CO. No.	Course Outcomes	Level	Unit
CO1	Develop sentence formation and language functions in writing paragraphs and essays.	K6	I
CO2	Construct public speaking skills by following proper etiquette.	K3	II
CO3	Discover ability to analyse information from the given data and events for official meetings	K4	III
CO4	Choose suitable attitude for attending interviews and develop editorial and reference skills	K5	IV
CO5	Extend life skills strategies in work places for a successful career	K2	V
CO6	Find different English expressions and words by implementing professional and casual English conversations.	K1	VI

UNIT - 1
Soft Skills
Vocabulary Development
Written Communication

UNIT - 2
Spoken Communication
Speeches
Presentations

UNIT - 3
Meetings
Nonverbal Communication
Information Transfer

UNIT - 4
Interview and Interviewing skills
Editing Skills
Reference Skills

UNIT - 5
Assertive Skills
Adaptability Skills

Problem-Solving Skills

TEXT BOOKS

1. Board of Editors, **"Synergy-Communication in English and Study Skills"**, Orient Blackswan. Pvt. Ltd., 2008.
2. G. M. Sundaravalli, A.S. Kamalakar, P. Kusuma Harinath, **"Communication and Soft Skills"**, Orient Blackswan Pvt. Ltd., 2015.
3. Bikram K. Das, **"Functional Grammar and Spoken and Written Communication in English"**, Orient Blackswan Pvt. Ltd., Kolkata, 2006.

B. Voc. [Information Technology] – Semester – II
Core Course – III: JAVA PROGRAMMING AND DATABASE MANAGEMENT SYSTEMS

COURSE CODE : U21IT203 **HOURS PER WEEK : 2**
CREDITS : 2 **TOTAL HOURS : 30**
JOB ROLE : Infrastructure Engineer (NSQF Level : 5) **COMPONENT : General**

COURSE OBJECTIVES:

To acquire programming experience and problem-solving expertise with exposure to Object Oriented Programming techniques and other facilities available in JAVA. and also understand the popular Relational Database System concepts and techniques.

COURSE OUTCOMES

After the successful completion of this course, the student will be able to

CO. No.	Course Outcomes	Level	Unit
CO1	Recall the concepts of Object Oriented Programming.	K1	I
CO2	Illustrate Classes, Objects and explain the Packages and Interfaces.	K2	II
CO3	Develop the methods for handling Events and Exceptions.	K3	III
CO4	Examine the Java Database connectivity.	K4	III
CO5	Explain the popular relational data base system concepts and techniques	K5	IV
CO6	Construct different normal forms and practice with SQL packages.	K6	V

UNIT - 1

Overview of Java- Single and Two dimensional Arrays, - Methods, General form, invoking,- method overloading,- Classes and objects General form, creation,- constructors- constructor overloading, copy constructor,-'this' keyword,-Static members,-finalize method,-Inner class and anonymous classes,-Inheritance –inheriting,- abstract classes and final classes,- Interfaces– structure, implementation,- Interface inheritance.

UNIT - 2

Packages– Package Hierarchy, - Import Statement, - Hiding the Classes, - Access Control Modifiers, - Applets – Life Cycle, - Applet Class, - Syntax of Applet Tag, - Methods in Graphics Class, - Threading, Life Cycle, Creating and Running, - Methods in Thread Class, - Priority Thread, - Synchronization.

UNIT - 3

Events, Listeners,-Event Handling Methods,-Inheritance of Control Classes,-Labels,-Button Control,-Check Box Control,- Radio Button,- Choice Control,- List Control,- Scroll Bars,- Layouts and Panel,- Windows and Frames,- Menus and Dialogs,- Mouse Events and Listeners, Adapter Class and Inner Class,- Exception Handling– Default Exception– User Defined Exception Handling,- Exception and Error Classes,- Catch Block - Throw and Throws- JDBC– Establishing Connection,- Creating Tables,- Enter Data,- Table Updating

UNIT - 4

Introduction to Database System- File Management Systems - Database Management Systems - File Management Systems Vs Database Management Systems - An Overview of Database Management Systems - Data Model -Relational Model: Relational Database Primer - Relational Database Characteristics - Database Integrity – Keys - Entity and Referential Integrity - Views.

UNIT - 5

Database Design- Design Consideration - Functional Dependency - Normalization and Normal Forms (1NF, 2NF, 3NF, 4NF, 5NF) - E/R Modeling- Introduction to SQL-SQL Query language – SQL data definition – Basic, set and aggregate operation –Null values – Nested queries.

TEXT BOOK:

1. Muthu C, **"Programming in Java"**, Thompson Learning, 2004.
2. Atul Kahate, **"Introduction to Database Management Systems"**, 1st Indian Reprint, Pearson Education, Delhi, 2004.
3. Abraham Silberchatz, Henry F. Korth and S. Sudharshan, **"Data Base System concepts"** Mc Graw Hill International – Fourth Edition.(Chapter-3)

REFERENCE BOOKS:

1. Patrick Naughton& Hebert Schildt, **"The Complete Reference JAVA 2",** 3 ed,TMH, Delhi,
2. E. Balagursamy, **"Programming with Java – A Primer"**, Third Edition, Tata McGraw-Hill Publishing Company Limited, 2007

B. Voc. [Information Technology] – Semester – II
Core Course – IV: COMPUTER NETWORKS

COURSE CODE : U21IT204 **HOURS PER WEEK : 2**
CREDITS : 2 **TOTAL HOURS : 30**
JOB ROLE : Infrastructure Engineer (NSQF Level : 5) **COMPONENT : General**

COURSE OBJECTIVES:

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to

CO. No.	Course Outcome	Level	Unit
CO1	Explain Fundamental concepts of Computer Networks, its Architecture, Communication Concepts and Media.	K2	I
CO2	Illustrate Error Detection and Correction techniques, Error Control, Flow Control and Communication Protocols.	K2	II
CO3	Identify the functioning of Integrated Services and Switching techniques such as ISDN, Frame Relay and ATM.	K3	II
CO4	Explain the concepts and working of LAN and WAN networks.	K4	III
CO5	Describe the working of WLANs, Internetworking & Transport Layer Protocols	K5	IV
CO6	Discuss the different aspects of Network Applications & Network Management.	K6	V

UNIT - 1

Introduction: History-Applications–Computer Network Topologies–Categories of Networks–Networks – Network Architecture –OSI Model –TCP/IP Architecture **-Communication Media and Data Transmission:** Analog & Digital Data Transmission–Modulation & Demodulation–Transmission Media –Wireless Communications–Data Transmission Basics-Transmission Modes– Interfacing – Multiplexing.

UNIT - 2

Error Detection and Correction: Types of Errors – Error Detection – Error Correction. **- Data Link Control and Protocol Concepts:** Flow Control – Error Control – Asynchronous Protocols – Synchronous Protocols – HDLC - **Integrated Services and Routing Protocols:** Integrated Services – ISDN Services – ISDN Topology – ISDN Protocols – ATM – Characteristics – Frame Relay – Comparison of ISDN, ATM and Frame Relay.

UNIT - 3

LAN: Types of Network and Topology – LAN Transmission Equipment – Ethernet – Token bus – Token ring – Fibre Distributed Data Interface – Distributed Queue Dual Bus – LAN Operating Systems and Protocols – Ethernet Technologies. **WAN:** Transmission Methods – Carrier Types – Transmission Equipment – Design and Multicast Considerations –Protocols.

UNIT - 4

Wireless LAN: Applications – Requirements – Planning – Architecture – IEEE 802.12 – Protocol Layer – Physical Layer – Designing the Wireless LAN Layout – WAP Services **- Internetworking:** Principles – Routing – Internetwork Protocols – Shortcomings of IPv4 – IP Next Generation **- TCP Reliable Transport Services:** Transport Protocols – The Service TCP Provides to Applications – End-to-End Service and Datagrams – Transmission Control Protocol – User Datagram Protocol.

UNIT - 5

Network Applications: Client-Server Model–DNS–Telnet–File Transfer & Remote File Access–Electronic Mail–World Wide Web-**Network Management:** Goal of Network Management–Standards–Network Management Model–Infrastructure for Network Management–Simple Network Management Protocol.

TEXT BOOK

1. Brijendra Singh, **"Data Communications and Computer Networks"**, 2nd Edition, PHI, 2006.

REFERENCE BOOKS

1. William Stallings, **"Data and Computer Communications"**, 8th Edition, Pearson Education, 2007.
2. Behrouz A. Forouzan, **"Data Communications and Networking"**, 4th Edition, Tata McGraw Hill Publishing Company, 2006.

B. Voc. [Information Technology] – Semester – II

Environmental Studies Course : ENVIRONMENTAL STUDIES

COURSE CODE : U16EST21	**HOURS PER WEEK : 2**
CREDITS : 2	**TOTAL HOURS : 30**
JOB ROLE : Infrastructure Engineer (NSQF Level : 5)	**COMPONENT : General**

COURSE OBJECTIVES :

Unit – I: The Multidisciplinary nature of Environmental Studies

Definition, Scope and Importance. Need for Public awareness

Unit – II : Nature Resources:

Renewable and Non-renewable resources

Forest resources: Use and over-exploitation, deforestation, case studies, Timber extraction, mining, dams and their effects on forests and tribal people. - **Water resources:** Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dam benefits and problems .-**Mineral resources:** Use and exploitation, environmental effects of extracting and using mineral resources, case studies. -**Food resources:** World food problems, change4s caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity case studies.-**Energy resources:** Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case Studies.-**Land resources:** Land as a resource, land degradation, man induced landslides, soil erosion and desertification. - Role of an individual I conservation of natural resources. - Equitable use of resources of sustainable lifestyles.

Unit – III : Ecosystems: Ecosystems

Concept of an ecosystem, Structure of an ecosystem, producers, consumers, decomposers, energy flow in the ecosystem, ecological succession, food chains, food webs and ecological pyramids. - Introduction, types, characteristics features, structure and function of ecosystem: - Forest ecosystem, - Grassland ecosystem, - Desert ecosystem, - Aquatic ecosystems (Ponds, streams, lakes, rivers, oceans, estuaries).

Unit – IV : Biodiversity and its conservation:

Introduction-definition : Genetic, species and ecosystem diversity, Biogeographical classification of India, value of biodiversity: Consumptive use, productive use, social ethical, aesthetic and option values, Biodiversity at global, National and local level, India as a megadiversity nation, Hot-spots of biodiversity, Threats to biodiversity : habit los, poaching of wildlife, man-wildlife conflicts, Endangered and endemic species of India, Conservation of biodiversity In-situ conservation of biodiversity.

Unit – V : Environmental Pollution:

Definition, Causes, effects and control measures of

a. Air Pollution b. Water Pollution c. Soil Pollution d. Marine Pollution

e. Noise Pollution f. Thermal Pollution g. Nuclear Hazards

Solid Waste Management: Causes, effects and control measures of urban and industrial wastes, role of an individual in prevention of pollution, pollution case studies.

Unit – VI: Social Issues and the Environment:

From unsustainable to sustainable development, Urban problems related to energy, water conservation, rain water harvesting, watershed management, resettlement and rehabilitation of people; its problems and concerns. Case studies, Environmental ethics: Issues and possible solutions, climate change, global warning, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies, wasteland reclamation, consumerism and waste products Environment Protection Act, Air (Prevention and Control of Pollution) Act, Forest (Conservation) Act, issues involved in enforcement of environmental legislation, public awareness.

Unit – VII: Human Population and the Environment:

Population growth, variation among nations, Population explosion-family welfare programme environment and human health, human rights, value education, HIV/AIDS, women and child welfare, role of information technology in environment and human health, case studies.

Unit – VIII: Field Work: Environmental Service Learning (ESL)

1. **Integrated learning:**
   Survey and Planning: Visit to a local area to document environmental assets-river/forest/grassland/hill/mountain, visit to a local polluted site -Urban/Rural/Industrial/Agricultural, study of common plants insects, birds, study of simple ecosystems-pond, river, hill slopes, etc.
2. **Service to the Community:** Action plan
3. **Student Voice:** Creating awareness and implementation of Action plan
4. **Civic Responsibility:** ESL activity of students and its effect on chosen community – Voice of the community
5. **Reflection:** Before, during and after the project – to draw links between social and personal aspects of the project and academic curriculum. The five elements of "Environmental Service Learning" incorporates – exploring/mapping local environments; making community partners; participating in local environmental service; reflecting on the learning which results from the service; and celebrate/communicating about environmental stewardship.

B. Voc. [Information Technology] – Semester – II
English Practical Course – II : ENGLISH LANGUAGE LAB – II

COURSE CODE : U22EGIP2 **HOURS PER WEEK : 3**
CREDITS : 3 **TOTAL HOURS : 45**
JOB ROLE : Infrastructure Engineer (NSQF Level : 5) **COMPONENT : Skill**

COURSE OBJECTIVES :
To obtain practical training on English usage and discourse styles for use in day-to-day context and to initiate the skills of thinking, evaluating and writing.

COURSE OUTCOMES :

CO No.	Course Outcomes	Level	Exercise
CO1	Illustrate excellent communication skills.	K1	1,2
CO2	Analyse information from various sources and examine the evidence provided to make a decision.	K4	3
CO3	Interpret visual data, understand its content to explain, evaluate information and also to present information in visual form.	K5	4
CO4	Develop ability to manage time and sort out priorities for self-learning.	K6	5
CO5	Analyse the given statements to understand and deduce the required information for aptitude tests.	K4	6,7
CO6	Develop skills to face different stages of interview.	K6	8,9,10

Remedial Grammar and Writing Skills

1. Types of Sentences
2. Tenses
3. Articles and Prepositions
4. Punctuations
5. Brainstorming and Gathering Information
6. Organizing Information and Writing the First Draft
7. Proof Reading
8. Descriptions
9. Narrations

10. Expositions
11. Persuasions
12. Essays
13. Paragraphs
14. Précis
15. Abstract
16. Leaving a Note
17. Preparing Agenda, Minutes etc.

B. Voc. [Information Technology] – Semester – II
Core Practical Course – III : JAVA AND RDBMS LAB

COURSE CODE : U21IT2P3 **HOURS PER WEEK : 5**
CREDITS : 5 **TOTAL HOURS : 75**
JOB ROLE : Infrastructure Engineer (NSQF Level : 5) **COMPONENT : Skill**

COURSE OBJECTIVES :
To obtain hands on experience in working with essential facilities available in Java and popular RDBMS software.

COURSE OUTCOMES

After the successful completion of this course, the student will be able to

CO No.	Course Outcomes	Level	Exercise
CO1	Identify classes, objects with Inheritance	K3	1 – 2
CO2	Examine Packages and Interfaces	K4	3 – 4
CO3	Evaluate user defined exceptions, multithreading and applets	K5	5 – 7
CO4	Develop database applications with AWT controls	K6	8 – 9
CO5	Explain various SQL commands with nested queries	K3/K4	10 – 12
CO6	Construct form builders and create reports with database operations	K5/K6	13 – 14

JAVA Programs:

1. Develop Java Programs using Classes and Objects
2. Implement Java Programs using different types Inheritance
3. Develop Java Programs using Interfaces
4. Design and develop Packages in Java
5. Write Java Programs to handle Exceptions
6. Develop a Java Program to implement Multithreading
7. Implement Applet Programming in Java
8. Develop Java programs applying the AWT concepts
9. Implement JDBC to handle databases in Java.

RDBMS

1. Creating updating and inserting into databases & simple queries.
2. Usage of select statement – for queries using
   i. AND, OR, NOT Operators, WHERE clause.
   ii. UNION, INTERESECTION, MINUS.
   iii. Aggregate operations
3. Form Nested queries using SOL
   i. Sub queries
4. Implementation of Built–in functions of SQL.
5. Case studies: - Use forms for database manipulations and generate appropriate reports for the following

i. Student evaluation systems.
ii. Pay – roll system.
iii. Income tax calculations
iv. Seat reservation Problem
v. Mark sheet Preparation.

B. Voc. [Information Technology] – Semester – II
Core Practical Course – IV : COMPUTER HARDWARE AND NETWORKING LAB

COURSE CODE : U21IT2P4 **HOURS PER WEEK : 4**
CREDITS : 4 **TOTAL HOURS : 60**
JOB ROLE : Infrastructure Engineer (NSQF Level : 5) **COMPONENT : Skill**

COURSE OBJECTIVES :
To acquire practical training in and Computer Hardware and Networking

COURSE OUTCOMES

After the successful completion of this course, the student will be able to

CO No.	Course Outcomes	Level	Exercise
CO1	Identify the hardware components in a PC and organize it.	K3	1, 2
CO2	Examine the size of a hard disk and divide the space required to install OS.	K4	3, 4
CO3	Deduct failure in computer components through troubleshooting process.	K5	5
CO4	Construct a network through network cables, network devices and test the connections.	K6	6, 7, 8
CO5	Compare various routing algorithms to communicate with nodes in a network.	K5	9,10,11
CO6	Analyze performance of various communication protocols	K6	12

Computer Hardware Lab:

1. Identifying Computer Components and Assembling a PC
2. Partitioning Hard Disk Drive and Installing Windows OS
3. Installing Linux Operating System
4. Installation of Device Drivers
5. Backing-up and Restoring Operating System
6. Preparing Bootable USB Drives

Networking Lab:

1. Crimping a Straight-Through Cable
2. Crimping a Cross-Connected Cable
3. Peer-to-Peer Network Sharing of Files
4. Wireless Network Sharing

5. Internet Modem Configuration
6. Static Routing
7. Default Routing
8. Dynamic Routing
9. Static Network Address Translation
10. Dynamic Network Address Translation
11. Point-to-Point Authentication Protocols - (PAP)
12. Point-to-Point Authentication Protocols - (CHAP)

B. Voc. [Information Technology] – Semester – III
Core Course – V : .NET PROGRAMMING

COURSE CODE : U21IT305 **HOURS PER WEEK : 3**
CREDITS : 3 **TOTAL HOURS : 45**
JOB ROLE : Master Trainer for Junior Software Developer (NSQF Level : 6) **COMPONENT : General**

COURSE OBJECTIVES :
To acquire knowledge on Server Side Programming using .NET framework

COURSE OUTCOMES

After the successful completion of this course, the student will be able to

CO No.	Course Outcomes	Level	Units
CO1	Define the features of .NET framework, C# language & Visual Studio	K1	I
CO2	Demonstrate the working of ASP.NET	K2	I
CO3	Compare web application, windows application and their controls	K3	II
CO4	Categorize Validation controls, Rich controls and Navigation controls	K4	III
CO5	Explain the directories and class libraries of .NET framework	K5	IV
CO6	Develop ADO.NET data applications	K6	V

UNIT - 1

The .NET Platform and the Web: The Pathway to Web applications - The Web Client/Server model - Components of ASP.NET and the .NET Framework - Overview of Internet Information Server – Overview of ASP.NET - .NET Conmen Language Runtime and Class Library – Managed Components in .NET – Web Services - Language Independence in the .NET Frame Work – **Working with ASP.NET: -** The Features of ASP.NET – The Anatomy of ASP.NET Pages – Introducing Web Forms – VS.NET Web Applications and other IDE Basics – Separating Content and Code-the Code-Behind Feature-Application Configuration.

UNIT - 2

Using HTML Controls – Using Web Controls – Web Controls for Displaying and Formatting Data – Web Control for Creating Buttons – Web Controls for Inputting Text – Web Control for Selecting Choices – Web Controls for Creating Lists – Miscellaneous Basic Controls – Creating a Simple ASP.NET Application – ASP.NET Page Directives.

UNIT - 3

ASP.NET Rich Controls-Validation Controls–Data List Controls–User Controls–ASP.NET Intrinsic Objects.

Unit - 4

Using the .NET Framework Class Library: Common Features of the .NET Framework Class Library – Using Data Collections – Handling File Input/Output and Directories – Using the Windows Events Log – Manipulating XML Data - Sending Internal E-mail.

Unit - 5

Accessing Data with ADO .NET: Overview of Data access on the Web – ADO.NET: The Next Generation of Data Access – ADO.NET Programming Objects and Architecture – Working with Datasets and Data Table Objects – Maintaining Data Integrity with the Data Relation Classes.

TEXT BOOK

1. Matt J. Crouch ***"ASP.NET and VB.NET Web Programming"***, Pearson Education. 2010.

REFERENCE BOOK

1. Matthew Mac Donald, ***"ASP.NET:-The Complete Reference"***, TMH, New Delhi, 2002.

B. Voc. [Information Technology] – Semester – III
Core Course – VI : DATA STRUCTURES AND ALGORITHMS

COURSE CODE : U21IT306 **HOURS PER WEEK : 3**
CREDITS : 3 **TOTAL HOURS : 45**
JOB ROLE : Master Trainer for Junior Software Developer (NSQF Level : 6) **COMPONENT : General**

COURSE OBJECTIVES :
To understand the popular Data Structures and Algorithms involved in Computing.

COURSE OUTCOMES

After the successful completion of this course, the student will be able to

CO No.	Course Outcomes	Level	Units
CO1	Recall the linear representation of data structures.	K1	I
CO2	Illustrate Non-linear representation of organization of data.	K2	I
CO3	Identify the graph representation of data.	K3	II
CO4	Examine the best and worst cases of searching and sorting techniques.	K4	III
CO5	Determine the greedy method to find optimal solution.	K5	IV
CO6	Adapt back tracking in greedy method for finding solution.	K6	V

UNIT - 1
Arrays and Sequential Representations – Ordered Lists – Stacks and Queues – Evaluation of Expressions – Multiple stacks and queues – Singly Linked Lists – Linked Stacks and Queues – Polynomial Addition – Doubly Linked Lists.

UNIT - 2
Trees – Binary tree representations – Tree traversal – Threaded binary trees – Binary tree representation of trees – Set representations – decision trees – Game Trees and counting Binary Trees – Graphs and Representations – Traversals. – Activity Networks – Topological sort.

UNIT - 3
Algorithms – Conventions – Writing Structured programs – Analyzing algorithms – Sorting – Heap sort – Binary Search – Finding the maximum and minimum – Merge sort – Quick sort – Selection Problem.

UNIT - 4
Greedy Method: The general method – Optimal storage on tapes – Knapsack problem – Job sequencing with deadlines – Optimal merge patterns – Minimum spanning trees – Single source shortest paths.

UNIT - 5
Backtracking: The General method – 8-Queen's problem – Sum of subsets – Graph colouring – Hamiltonian cycles – Knapsack problem.

Note : *Theorems on correctness procedures and derivations of time complexity are not expected.*

TEXT BOOKS

1. Ellis Horowitz, Sartaj Sahni, **"Fundamentals of Data Structures"**, Galgotia Publications., Delhi, Reprint 2001.
2. Ellis Horowitz, Sartaj Sahni, **"Fundamentals of Computer Algorithms"**, Galgotia Publications., Delhi, Reprint 2001.

REFERENCE BOOKS

1. Seymour Lipschutz, "Data Structure", Schaum's Outline, Tata McGrawHill Education Pvt. Ltd., 2005.
2. Samanta D., "Fundamentals of Data Structures for Students", Shroff Publishers and Distributers. Pvt. Ltd., Mumbai, 2015.
3. Alfred V. Aho, John E. Hopcroft, Jeffry D. Ullman, "The Design and Analysis of Computer Algorithms", Pearson Education, 2002.

B. Voc. [Information Technology] – Semester – III
Core Course – VII : DIGITAL PRINCIPLES AND COMPUTER ORGANIZATION

COURSE CODE : U21IT307 **HOURS PER WEEK : 4**
CREDITS : 4 **TOTAL HOURS : 60**
JOB ROLE : Master Trainer for Junior Software Developer (NSQF Level : 6) COMPONENT : General

COURSE OBJECTIVES :

To understand the building blocks of a Computer System and to become familiar with the concepts and techniques involved in Computer Organization.

COURSE OUTCOMES

After the successful completion of this course, the student will be able to

CO No.	Course Outcomes	Level	Units
CO1	Explain the Digital Concepts, Numbers Systems and Codes.	K2	I
CO2	Develop Combinational Logic and Data Processing Digital Circuits.	K3	I
CO3	Construct Arithmetic Circuits and Sequential Logic Circuits.	K3	II
CO4	Discover the Architecture of a Basic Computer and the CPU.	K4	III
CO5	Determine the Input and Output Systems required for a Computer	K5	IV
CO6	Design the Memory and Storage units required for a Computer	K6	V

UNIT - 1

Digital Principles: - Definition for Digital Signals – Digital Logic – **Number Systems and Codes:** – Binary Number System – Binary-to-Decimal Conversion – Decimal-to-Binary Conversion – Octal Numbers – Hexadecimal Numbers – ASCII Code – Excess-3 Code – Gray Code **- Digital Logic: -**Logic Gates – Universal Logic Gates – AND-OR-Invert Gates – Positive and Negative Logic. **- Combinational Logic Circuits: -** Boolean Laws and Theorems – SOP Method – Karnaugh Map – Pairs, Quads, Octets – Karnaugh Simplification – Don't Care Conditions – POS Method & Simplification – **Data Processing Circuits: -** Multiplexers – Demultiplexers – 1 of 16 Decoder – BCD to Decimal Decoder – Encoder.

UNIT - 2

Arithmetic Circuits: - Binary Addition – Binary Subtraction – Unsigned Binary Numbers – Sign Magnitude Numbers – 2's Complement Representation – 2's Complement Arithmetic – Arithmetic Building Blocks – The Adder-Subtractor – **Flip Flops: -**RS Flip Flops – Edge Triggered RS Flip Flop – D Flip Flop – JK Flip Flop –Master Slave Flip Flop **- Registers: -** Types of Registers – Serial In Serial Out – Serial In Parallel Out – Parallel in Serial Out – Parallel In Parallel Out – Universal Shift Register – Applications of Shift Registers – **Counters:** Asynchronous Counter –Synchronous Counters – Changing the Counter Modulus – Decade Counters– Presettable Counters.

UNIT - 3

Basic Computer Organization and Design: - Instruction Codes – Computer Registers – Computer Instructions – Timing and Control – Instruction Cycle – Memory Reference Instructions – Input, Output and Interrupts – Complete Computer Description – Design of Accumulator Logic. **- Central Processing Unit: -** General Register Organization – Stack Organization – Instruction Formats – Addressing Modes – Data Transfer and Manipulations – Program Control – RISC.

UNIT - 4

Input–Output Organization: -Peripheral Devices –Input-Output Interface–Asynchronous Data Transfer – Modes of Transfer–Priority Interrupts–Direct Memory Access– I/O Processor – Serial Communication.

UNIT - 5

Memory Organization: – Memory Hierarchy – Main Memory – Auxiliary Memory – Associative Memory – Cache Memory – Virtual Memory – Memory Management Hardware.

TEXT BOOKS

1. Donald P Leach, Albert Paul Malvino, Goutam Saha, **"Digital Principles and Applications"**, 7th Edition, TMH Publications, Delhi, 2011.
2. Morris Mano. M. **"Computer System Architecture"**, 3rd Edition, Pearsons Education, 2005.

REFERENCE BOOK

1. A. P. Godse, D. A. Godse, **"Digital Principles and System Design"**, 4th Edition, Technical Publications, Pune, 2020.

B. Voc. [Information Technology] – Semester – III
Core Course – VIII : PERSONAL EFFECTIVENESS

COURSE CODE : U21IT308 **HOURS PER WEEK : 2**
CREDITS : 2 **TOTAL HOURS : 60**
JOB ROLE : Master Trainer for Junior Software Developer (NSQF Level : 6) **COMPONENT : General**

COURSE OBJECTIVES :

To acquire skills that will help to be effective in personal and professional life.

COURSE OUTCOMES

After the successful completion of this course, the student will be able to

CO No.	Course Outcomes	Level	Units
CO1	Illustrate the Paradigms and Principles required for being effective in life.	K2	I
CO2	Develop the habits of being proactive and to begin with the end in mind	K3	I
CO3	Apply the habit of Prioritizing in Life.	K3	II
CO4	Discover the art of being effective with Win-Win and Empathetic Approach.	K4	III
CO5	Influence people and reap professional success by Synergizing	K5	IV
CO6	Maximize effectiveness by renewing and sharpening the skills.	K6	V

UNIT - 1

Paradigms and Principles : Inside-out: – Personality and Character Ethics –Primary and Secondary Greatness – Power of a Paradigm – Power of a Paradigm Shift – The Principle Centered Paradigm – Principles of Growth and Change – The Way we see the Problem is the Problem – A New Level of Thinking - **The Seven Habits-An Overview:** - Habits Definition – The Maturity Continuum – Effectiveness Definition – Three Kinds of Assets – Organizational Production Capacity -

Private Victory (Independence) : -

1 Being Proactive in roles and relationships in life.
2 Beginning with the End in Mind

UNIT - 2

Private Victory (Independence) :

3 Putting First Things First

UNIT - 3

Public Victory (Interdependence)

4 Think Win-Win: Genuine feelings for mutually beneficial solutions or agreements in relationships.

5 Seek First to Understand, Then to be understood - Use empathic listening to be genuinely influenced by a person, who compels them to reciprocate the listening and take an open mind to being influenced by you.

UNIT - 4

Public Victory (Interdependence)

6 Synergize - Combine the strengths of people through positive teamwork, so as to achieve goals that no one could have done alone.

UNIT - 5

Continuous Improvements

7 Sharpen the Saw - Balance and renew your resources, energy, and health to create a sustainable, long-term, effective lifestyle. lt primarily emphasizes exercise for physical renewal, prayer(meditation, yoga, etc.) and good reading for mental renewal. It also mentions service to society for spiritual renewal.

TEXT BOOK

1. R. Stephen Covey, **"Seven Habits of Highly effective people"**, Simon and Schuster Inc., 1989, reprint 2013.

B. Voc. [Information Technology] – Semester – III

Allied Practical Course – I : MATHEMATICS FOR COMPETITIVE EXAMINATIONS - I

COURSE CODE : U21IT309 **HOURS PER WEEK : 4**
CREDITS : 4 **TOTAL HOURS : 60**
JOB ROLE : Master Trainer for Junior Software Developer (NSQF Level : 6) **COMPONENT : Skill**

COURSE OBJECTIVES :

To acquire arithmetic skills required to face competitive examinations.

UNIT - 1

Numbers - HCF & LCM – Decimal Fractions – Simplification.

UNIT - 2

Square roots and Cube roots - Percentage – Average – Ratio and Proportion - Partnership.

UNIT - 3

Profit and Loss - Time and Work- Pipes and Cisterns - Time and Distance

UNIT - 4

Problems on Trains – Problems on Boats and Streams - Problems on Numbers - Problems on ages.

UNIT - 5

Simple interest – Compound interest Area - Volume & Surface Areas.

TEXT BOOK

1. R.S. Aggarwal, **"Objective Arithmetic"**, S. Chand & Company Ltd., New Delhi, 2003.

B. Voc. [Information Technology] – Semester – III
Core Practical Course – V : .NET PROGRAMMING LAB

COURSE CODE : U21IT3P5 **HOURS PER WEEK : 4**
CREDITS : 4 **TOTAL HOURS : 60**
JOB ROLE : Master Trainer for Junior Software Developer (NSQF Level : 6) **COMPONENT : Skill**

COURSE OBJECTIVES :
To obtain hands on experience in writing server side programs using ASP.NET

COURSE OUTCOMES
After the successful completion of this course, the student will be able to

CO No.	Course Outcomes	Level	Exercises
CO1	Build web pages using Web Server Controls	K3	1, 2
CO2	Make use of Validation Controls to validate user inputs	K3	3
CO3	Examine and retrieve input data using Code Behind feature.	K4	4
CO4	Build database applications to manage and manipulate data.	K5	5, 6,7
CO5	Create Web Portal using Menus and Master Page.	K6	8, 9
CO6	Construct Web Services to distribute data to different platforms.	K6	10

1. Design ASP.NET Web form using Web Server controls to enter job seeker's details.
2. Create an ASP.NET Web form using web control to enter Email Registration form.
3. Apply appropriate validation techniques in Email registration form using validation controls.
4. Write an ASP.NET application to retrieve form data & display it in the client browser in table format.
5. Create a Web application to store the details of the books available for sale in XML format.
6. Create a Web application using ADO.Net that uses which performs basic data manipulations: (i)Insertion (ii) Updating (iii) Deletion (iv)Selection

7. Create an application using Data grid control to access information's form table in SQL Server.
8. Write an ASP.NET application for registering in on-line courses of Bharathidasan University.
9. Develop a Portal for our College.
10. Display a "HELLO" message using Web Services.

B. Voc. [Information Technology] – Semester – III
Core Practical Course – VI : DATA STRUCTURES AND ALGORITHMS LAB

COURSE CODE : U21IT3P6 **HOURS PER WEEK : 4**
CREDITS : 4 **TOTAL HOURS : 60**
JOB ROLE : Master Trainer for Junior Software Developer (NSQF Level : 6) **COMPONENT : Skill**

COURSE OBJECTIVES :
To acquire programming expertise in handling popular Data Structures & Algorithms.

COURSE OUTCOMES
After the successful completion of this course, the student will be able to

CO No.	Course Outcomes	Level	Exercises
CO1	Identify the linear representation of data structures using arrays.	K3	1,2
CO2	Examine the various applications of stacks and queues.	K4	3,4
CO3	Apply the concepts of linked list.	K3	5-7
CO4	Determine best and worst case of various sorting and searching algorithms.	K5	9-14
CO5	Recommend greedy method to find optimal solution.	K5	15
CO6	Adapt back tracking in greedy method for finding solution.	K6	16,17

1. Develop programs to handle Single Dimensional Array
2. Develop programs to handle Multi-Dimensional Array
3. Create programs to implement Queue Operations.
4. Create programs to implement Stack Operation
5. Create programs to implement Single Linked List
6. Create programs to implement Doubly Linked Lists.
7. Create a program to implement Tree Traversals.

8. Write a program to perform Heap Sort
9. Write a program to perform Quick Sort.
10. Write a program to perform Merge Sort.
11. Write a program to perform Bubble Sort
12. Write a program to perform Selection Sort
13. Write a program to perform Linear search.
14. Write a program to perform Binary search.
15. Create a program to implement Knapsack Algorithm
16. Create a program to implement the Spanning Tree Algorithm
17. Create a program to implement the Single Source Shortest Path Algorithm

B. Voc. [Information Technology] – Semester – IV
Core Course – IX : OPERATING SYSTEM

COURSE CODE : U21IT410 **HOURS PER WEEK : 3**
CREDITS : 3 **TOTAL HOURS : 45**
JOB ROLE : Master Trainer for Junior Software Developer (NSQF Level : 6) **COMPONENT : General**

COURSE OBJECTIVES :
To know the concepts and functions of Operating Systems used in modern Computing Systems.

COURSE OUTCOMES
After the successful completion of this course, the student will be able to

CO No.	Course Outcomes	Level	Units
CO1	Interpret basics of Operating system, characteristics and features of modern OS like UNIX, LINUX and WINDOWS etc.	K2	I
CO2	Experiment with the requirement for process synchronization and coordination handled by Operating System.	K3	II
CO3	Examine the various CPU scheduling algorithms and analyze the characteristics of deadlock and recovery of deadlock	K4	III
CO4	Determine memory management techniques and the necessity of virtual memory.	K5	IV
CO5	Evaluate the storage management policies with respect to different storage management technologies	K5	V
CO6	Discuss file system interface, protection and security mechanisms.	K6	V

UNIT - 1
Introduction to Operating System: - Overview of Operating System-The Evolution of Operating System-Types of Operating Systems-Functions of Operating System-Characteristics of Modern Operating System-Operating System Structure.

UNIT - 2
Processes: Process Concept-Comparison of Process and Programs - Process States-Process Scheduling-Ready Queue vs. Device Queue-Operations on a Process-Cooperating Processes-Threads - Interprocess Communication. **Process Synchronization:** Racing Problem-Avoiding Racing Problem-Requirement for Critical Problem-Critical Section algorithms-OS tools for Process Synchronization-Classical Synchronization Problems-Monitors-Inter Process Communication for Message Communication.

UNIT - 3
Deadlocks: Introduction-System Model-Deadlock Characteristics-Deadlock Detection-Deadlock Prevention-Deadlock Avoidance-Deadlock Recovery-Other methods of Deadlock Recovery. - **CPU Scheduling:**

Schedulers-Scheduling Criteria-CPU Scheduling Algorithms-Multiple Processor Scheduling-Real time Scheduling-Performance Comparison.

UNIT - 4

Memory Management: Introduction-Logical versus Physical address space-Program Relocation-Logical Organization-Physical Organization-Dynamic Loading and Dynamic Linking-Memory Allocation Techniques. - **Virtual Memory:** Swapping-Demand Paging-Page Fault-Page Replacement Algorithms-Thrashing-Page replacement policies-Local and Global-Demand Segmentation-OS Software factors.

UNIT - 5

Information Management: Introduction-A Simple File System-File Access Methods-Directory Structure-File Protection-I-nodes-Free Space Management Techniques-Record Blocking. - **Secondary Storage Structure:** Introduction-Hard Disk Structure-Hard Disk Performance Parameter-Hard Disk Scheduling Algorithms-Swap Space Management-RAID and its level-Disk Space Allocation Methods-Stable Storage Implementation.

TEXT BOOK

1. S. Rajiv Chopra, **"Operating Systems–A Practical Approach"**, 2nd Edition, S. Chand & Company Pvt. Ltd., New Delhi, 2013.

REFERENCE BOOKS

1. Abraham Silberschatz, Peter B. Galvin, Greg Gange, "Operating System Concept", 9th Edition, Wiley India Pvt. Ltd., 2015.
2. Andrew S. Tanenbaum, Herbert Bos, "Modern Operating Systems", 4th Edition, Pearson Education, 2014.
3. William Stallings, "Operating Systems Internal & Design Principles", 6th Edition, Pearson Education, **2009.**

B. Voc. [Information Technology] – Semester – IV
Core Course – X : MOBILE COMPUTING TECHNOLOGIES

COURSE CODE : U21IT411 **HOURS PER WEEK : 3**
CREDITS : 3 **TOTAL HOURS : 45**
JOB ROLE : Master Trainer for Junior Software Developer (NSQF Level : 6) **COMPONENT : General**

COURSE OBJECTIVES :

To impart knowledge on the working of mobile communication systems and to acquire expertise in application development for Mobile Computing systems.

COURSE OUTCOMES

After the successful completion of this course, the student will be able to

CO No.	Course Outcomes	Level	Units
CO1	Define Mobile Telecommunication networks and wireless communication system.	K1	I
CO2	Demonstrate the understanding of mobile computing and wireless networking.	K2	II
CO3	Compare mobile databases for the best fit transaction process in mobile environment.	K3	III
CO4	Categorize various Mobile Operating Systems.	K4	IV
CO5	Determine the android application with suitable User Interface and data manipulation.	K5	IV
CO6	Develop Applications for Android Devices includes content providers and networking.	K6	V

UNIT - 1

Basics of Communication Technologies : Types of Telecommunication Networks – Components of a Wireless Communication System – Architecture of Mobile Telecommunication Systems – Wireless Networking Standards – WLAN – Bluetooth Technology – **Introduction to Mobile Computing and Wireless Networking :** Mobile Computing – Mobile Computing Vs. Wireless Networking – Characteristics of Mobile Computing - Structure of Mobile Computing Applications – Cellular Mobile Communication – GSM – GPRS – UMTS.

UNIT - 2

MAC Protocols : Properties – Issues – Taxonomy –Assignment Schemes – MAC Protocols for Ad Hoc Networks. - **Mobile Internet Protocol :** – Mobile IP – Packet Delivery – Overview – Desirable Features – Key Mechanism – Route Optimization – DHCP - **Mobile Transport Layer :** Overview of TCP/IP –Terminologies – Architecture – Operations – Application Layer Protocols of TCP – Adaptation of TCP Window – Improvement in TCP Performance.

UNIT - 3

Operating Systems for Mobile Computing : Mobile OS Responsibilities – Basic Concepts – Special Constraints and Requirements – Commercial Mobile OSs – Comparative Study of Mobile OSs – OS for Sensor Networks – **Mobile Application Development Protocols : -** Mobile Devices as Web Clients – WAP – J2ME – Android SDK.

UNIT - 4

Getting Started with Android –**-** Activities, Fragments and Intents – Android User Interface – Designing User Interface with views – Displaying Pictures and Menus with Views – Data Persistence.

UNIT - 5

Content Providers – Messaging – Location Based Services – Networking – Developing Android Services – Publishing Android Applications.

TEXT BOOKS

1. Prasant Kumar Pattnaik, Rajib Mall, "Fundamentals of Mobile Computing", PHI Learning
2. Wei Meng Lee, "Beginning Android 4 Application Development", Wiley India Pvt. Ltd.., 2012.

REFERENCE BOOKS

1. Ashok K Talukder, Hasan Ahmed, Roopa R Yavagal, "Mobile Computing", 2nd Edition, Tata McGraw Hill Publishing Company Limited, 2010.
2. Jochen Schiller, "Mobile Comunications", Pearsons Education, 2008.
3. Reto Meir, "Professional Android 4 Application Development", Wiley India Pvt. Ltd., 2012
4. Pradeep Kotari, "Android Application Development Black Book", Dreamtech Press, 2014.

B. Voc. [Information Technology] – Semester – IV
Core Course – XI : MICROPROCESSORS AND ITS APPLICATIONS

COURSE CODE : U21IT412 **HOURS PER WEEK : 4**
CREDITS : 3 **TOTAL HOURS : 60**
JOB ROLE : Master Trainer for Junior Software Developer (NSQF Level : 6) **COMPONENT : General**

COURSE OBJECTIVES :

To understand the structure, architecture and applications of microprocessors.

COURSE OUTCOMES

After the successful completion of this course, the student will be able to

CO No.	Course Outcomes	Level	Units
CO1	Recall and apply a basic concept of digital fundamentals to Microprocessor based personal computer system	K2	I
CO2	Make use of Assembly Language Program in Microprocessor.	K3	II
CO3	Illustrate how peripherals (8255, 8253 etc.) are interfaced with Microprocessor.	K2	III
CO4	Distinguish and analyze the properties of Microprocessors & Microcontrollers.	K4	III
CO5	Evaluate application on assembly language program download the machine code to provide solutions to real world control problems.	K5	IV
CO6	Discuss the architectures of other popular Microprocessors & its Addressing Modes.	K6	V

UNIT - 1

Introduction: - Word Length – Evolution of Microprocessors and Digital Computers –CPU – Memory – Busses – Processing Speed – **Microprocessor Architecture:-** Introduction–Intel 8085– Instruction Cycle– Timing Diagram- **Instruction Set of Intel 8085:-** Introduction– Instruction and Data Formats– Addressing Modes–Status Flags–Symbols & Abbreviations–Intel 8085 Instructions.

UNIT - 2

Assembly Language Programs: - Introduction – Addition and Subtraction (8 and 16-bits) – Decimal Addition and Subtraction – One's and Two's Complements (8 and 16) – Shifting and Masking – Largest and Smallest Numbers – Ascending and Descending Order – Sum of a Series – Multiplication and Division – Multi-byte Addition and Subtraction – Square-Root of a number – Block Transfer

UNIT - 3

Peripheral Devices and their Interfacing: - Introduction – Address Space Partitioning – Memory and I/O Interfacing – Data Transfer Schemes – Interrupts of Intel 8085 – Interfacing Devices and I/O Devices

– I/O Ports – Programmable DMA Controller – Programmable Interrupt Controller – Programmable Communication Interface – Programmable Counter/Interval Timer.

UNIT - 4

Microprocessor Applications: - Introduction – Delay subroutines – 7 Segment LED Display – Frequency Measurement – Measurement of Voltage and Current – Resistance Measurement –Water Level Indicator – Traffic Control.

UNIT - 5

Other Microprocessors: - Introduction – Intel 8086 – Classification of Intel 8086 Instructions – Binary - Addresses of Intel 8086 Registers – Description of Intel 8086 Instructions - Intel 8088 – Intel 80186 - Intel 80286 – Intel 80386 – Intel 80486 – Intel Pentium I, II, III and IV Processors.

TEXT BOOK

1. B Ram, "Fundamentals of Microprocessors and Microcomputers", 5th Revised and Enlarged Edition, Dhanpat Rai Publications (P) Ltd., New Delhi, 2003.

REFERENCE BOOK

1. Anokh Singh, A. K. Chhabra, "Fundamentals of Microprocessor and its Applications", S. Chand Publishers, 2010.

B. Voc. [Information Technology] – Semester – IV
Core Course – XII : PROFESSIONAL ETHICS AND CYBER LAWS

COURSE CODE : U21IT413 **HOURS PER WEEK : 2**
CREDITS : 2 **TOTAL HOURS : 30**
JOB ROLE : Master Trainer for Junior Software Developer (NSQF Level : 6) **COMPONENT : General**

COURSE OBJECTIVES :

To understand professional ethics, human values and to appreciate the rights of others, To handle ethical dilemma while discharging duties in professional life and to understand Cyber Laws and their implications.

COURSE OUTCOMES

After the successful completion of this course, the student will be able to

CO No.	Course Outcomes	Level	Units
CO1	Apply values and ethics in professional environment	K3	I
CO2	Explain the principles and concepts associated with Cyber Security	K2	II
CO3	Classify and explain the aspects of Cyber Attacks	K2	III
CO4	Analyze the nature and consequences of Cyber Crimes	K4	III
CO5	Determine the nature of Cyber Laws and their legal implications	K5	IV
CO6	Discuss the nature and consequences of Cyber Crimes	K6	V

UNIT - 1

Professional Ethics : - Values – Morals - Ethics – Habits – Character - Integrity – Honesty – Empathy – Respect for Others – Courage – Confidence – Work Ethics - Social Responsibility - Time Consciousness – Team Building – Moral leadership – Commitment – Spirituality.

UNIT - 2

Cyber Security Principles : - Overview of Cyber Security - Cryptography – Digital and Electronic Signatures – Digital Certificates – Domain Naming System – Firewalls - Electronic Data Interchange (EDI) – Electronic Records and Authentication – E-Transactions - E-Commerce – E-Governance – Online Banking- Computer Forensics.

UNIT - 3

Cyber Attacks and Crimes : – Overview – Role of Computers – Perpetrators – Identity Thefts – SMS and E-Mail Spoofing – Hacking – Stalking – Carding – Infringement of Privacy – Cyber Bullying – Phishing – Cracking – Phreaking – Malicious Programs – Computer Fraud – Forgery and Counterfeiting – Theft of Telecommunication Services – IPR Infringements – Cyber Squatting - Economic Espionage – Tax Evasions – Computer Sabotage – Operating System Attacks –Application Attacks - Salami Attacks – Web Jacking – Money Laundering – Data Diddling – Pornography – Hate Propaganda – Cyber Warfare – Cyber Terrorism.

UNIT - 4

Cyber Laws – I : - Laws of Intellectual Property Rights – Copyright Act – Trademark and Merchandise Act – Patent Act – Domain Name Laws – Cyber Squatting Laws – Information Technology Act 2000.

UNIT - 5

Cyber Laws – II: - International Perspectives – United Nations (UN) & International Telecommunication Union (ITU) Initiatives - Council of Europe - Budapest Convention on Cybercrime - Asia-Pacific Economic Cooperation (APEC) - Organization for Economic Co-operation and Development (OECD) - World Bank Commonwealth of Nations – **Cyber Crime Laws : -** Classification of Offences – Investigations - Forming an Incident Response Team – Reporting Cyber Crime – Power of Arrests – Remedial Measures – Legislations – Preventive Measure – Power of Confiscation – Jurisdictional Problems.

TEXT BOOKS

1. Edmund G Seebauer and Robert L Barry, **"Fundamentals of Ethics for Scientists and Engineers"**, Oxford University Press, Oxford, 2000.
2. Shilpa Suryabhan Donre, **"Cyber Laws and its Applications"**, 2nd Edition, Current Publications, Mumbai, 2015.

REFERENCE BOOKS

1. John R Boatright, Jeffry D. Smith, Bibhu Prasan Patra, **"Ethics and the Conduct of Business"**, 8th Edition, Pearson Education, New Delhi, 2017.
2. James K. L., **"The Internet: A User's Guide"** 2nd Edition, Prentice Hall of India, New Delhi, 2010.
3. Ramappa T., **"Legal Issues in Electronic Commerce"**, Macmillan India Ltd, New Delhi, 2003.
4. Krishna Kumar, **"Cyber Laws – Intellectual Property and E-Commerce Security"**, Dominant Publishers and Distributers Pvt. Ltd., New Delhi, 2018.

B. Voc. [Information Technology] – Semester – IV

Allied Practical Course – II : MATHEMATICS FOR COMPETITIVE EXAMINATIONS - II

COURSE CODE : U21IT414 **HOURS PER WEEK : 4**
CREDITS : 4 **TOTAL HOURS : 60**
JOB ROLE : Master Trainer for Junior Software Developer (NSQF Level : 6) **COMPONENT : Skill**

COURSE OBJECTIVES :

To acquire arithmetic skills required to face competitive examinations.

UNIT - 1

Surds & Indices - Allegation or Mixture – True discount – Banker's discount

UNIT - 2

Stocks & Shares - Calendar - Clocks - Races & Games of Skill

UNIT - 3

Linear Equation in Two Variables - Quadratic Equations

UNIT - 4

Arithmetic and Geometric Progressions (A.P. & G.P.) - Geometry - Polygons

UNIT - 5

Number Series - Tabulation - Pie-Chart - Bar-Graphs - Line Graphs

TEXT BOOK

1. R.S. Aggarwal, **"Objective Arithmetic"** S. Chand & Company Ltd., New Delhi, 2003.

B. Voc. [Information Technology] – Semester – IV
Core Practical Course – VII : OPERATING SYSTEM LAB

COURSE CODE : U21IT4P7 **HOURS PER WEEK : 4**
CREDITS : 4 **TOTAL HOURS : 60**
JOB ROLE : Master Trainer for Junior Software Developer (NSQF Level : 6) COMPONENT : Skill

COURSE OBJECTIVES :
To obtain hands on experience with LINUX Operating System and Shell Programming

COURSE OUTCOMES
After the successful completion of this course, the student will be able to

CO No.	Course Outcomes	Level	Exercises
CO1	Extend basic, directory and VI editor commands of Linux	K2	1-3
CO2	Make use of Linux commands for file handling	K3	5-7
CO3	Experiment with Linux commands with shell programming	K3	8-12
CO4	Examine the use of various grep commands	K4	4,20
CO5	Determine various shell scripts for simple applications	K5	16-19
CO6	Create a User and Group Login permission	K6	14,15

1. Execution of Simple Shell Commands
2. Usage of Directory Commands
3. Employing Vi Editor Commands
4. Searching a word in a file
5. Displaying the content of a file.
6. Displaying Login Greeting Script
7. Displaying the current date, time, username and current directory.
8. Shell Program to print the given number in reverse order.
9. Preparation of Mark list using shell programming

10. Menu driven shell program to create, sort and display a file.
11. Menu driven shell program to copy, edit, rename and delete a file.
12. Shell Program to Sort numbers in ascending and descending order.
13. Shell Program to Sort names in ascending and descending order.
14. User Creation in Linux
15. Group Creation in Linux
16. Menu driven shell program for the following – Passwd, pconfig, ping
17. Shell program to find the number of ordinary files and directory files in the current directory.
18. Shell program to accept the name of the directory as command line argument and display the listing in that directory. By default, the "Home" directory's contents should be displayed.
19. Finding the list of all running processes and redirect the output in a file.
20. Monitoring and managing system log information

B. Voc. [Information Technology] – Semester – IV
Core Practical Course – VIII : MOBILE APPLICATIONS DEVELOPMENT LAB

COURSE CODE : U21IT4P8 **HOURS PER WEEK : 4**
CREDITS : 4 **TOTAL HOURS : 60**
JOB ROLE : Master Trainer for Junior Software Developer (NSQF Level : 6) COMPONENT : Skill

COURSE OBJECTIVES :
To obtain hands-on experience in Mobile Application Development for Android devices.

COURSE OUTCOMES
After the successful completion of this course, the student will be able to

CO No.	Course Outcomes	Level	Exercises
CO1	Build Android application with suitable user interface and android controls	K3	1 – 3
CO2	Make use of image controls perform coloring screen & animate bitmap images.	K3	4 – 6
CO3	Examine the user interface with dialog box and countdown timer.	K4	7 – 8
CO4	Interpret the android controls to store contact details and make phone call.	K5	9 – 10
CO5	Build Android Application to access media file from memory and store images from native applications	K5	11-12
CO6	Create Android Application to perform data manipulation such as Insert, update, delete and retrieve from SQLite database	K6	13

1. Create a simple application that displays a text "Hello World" with text and background color.
2. Create sample application for login module.
3. Create an application that changes the color of the screen based on selected options from the menu.
4. Create an application that will display toast (Message).
5. Create an application to change the image displayed on the screen using radio button.
6. Create an application to demonstrate alert dialog box.
7. Create an application to demonstrate countdown timer.

8. Create an application to animate a bitmap.
9. Create an application to demonstrate a simple video view.
10. Create an application to pick contacts using Intent.
11. Create an application to play a media file from the menu card.
12. Create an application to generate a new contact using Intent.
13. Create an application to make database operations

B. Voc. [Information Technology] – Semester – V
Core Course – XIII : PROGRAMMING WITH PHP AND MySQL

COURSE CODE : U21IT515 **HOURS PER WEEK : 4**
CREDITS : 4 **TOTAL HOURS : 60**
JOB ROLE : Software Developer (NSQF Level : 7) **COMPONENT : General**

COURSE OBJECTIVES :
To understand the Client and Server side Web Programming with PHP & MySQL.

COURSE OUTCOMES
After the successful completion of this course, the student will be able to

CO No.	Course Outcomes	Level	Units
CO1	Define Expressions, Operators, Conditionals, Looping, Implicit and Explicit Casting	K1	I
CO2	Explain the Functions and Objects	K2	I
CO3	Apply the Arrays and File Handling	K3	II
CO4	Classify Indexes, MySQL Functions, Accessing MySQL via phpMyAdmin	K4	III
CO5	Explain Accessing MySQL Using PHP	K5	IV
CO6	Discuss the Functions, Objects, and Arrays using with JavaScript	K6	V

UNIT - 1
Introduction to PHP: Incorporating PHP Within HTML - Examples -The Structure of PHP. **Expressions and Control Flow in PHP:** Expressions - Operators - Conditionals – Looping - Implicit and Explicit Casting - PHP Dynamic Linking.

UNIT - 2
PHP Functions and Objects: PHP Functions - Including and Requiring Files - PHP Version Compatibility - PHP Objects. **PHP Arrays:** Basic Access -The foreach...as Loop- Multidimensional Arrays -Using Array Functions. **Practical PHP:**Using printf - Date and Time Functions - File Handling

UNIT - 3
Introduction to MySQL: MySQL Basics - Summary of Database Terms Accessing MySQL via the Command Line – Indexes - MySQL Functions - Accessing MySQL via phpMyAdmin. **Accessing MySQL Using PHP:** Querying a MySQL Database with PHP - A Practical Example - Practical MySQL - Creating a Table - Preventing Hacking Attempts - Using mysql Procedurally. **Form Handling:**

Building Forms - Retrieving Submitted Data - An Example Program - What's New in HTML5? - Features Awaiting Full Implementation.

UNIT - 4

Cookies, Sessions, and Authentication: Using Cookies in PHP - HTTP Authentication - Using Sessions. **Exploring JavaScript** :Using Comments - Semicolons - Variables - Operators - Variable Typing -Functions - Global Variables - Local Variables- The Document Object Model -About document.write. **Expressions and Control Flow in JavaScript:** Expressions - Literals and Variables - Operators - The with Statement - Using onerror -Using try...catch –Conditionals - Looping -Explicit Casting

UNIT - 5

JavaScript Functions, Objects, and Arrays: JavaScript Functions - JavaScript Objects - JavaScript Arrays. **JavaScript and PHP Validation and Error Handling:** Validating User Input with JavaScript - Regular Expressions - Redisplaying a Form After PHP Validation. **Using Ajax:**
What Is Ajax? - Using XMLHttpRequest

TEXT BOOK

1. Robin Nixon., "Learning PHP, MySQL and JavaScript ", O'reilly Publishers , 2009.

REFERENCE BOOK

1. Huge E Williams and David Lane , "Web Database Applications with PHP and MySQL" , O'reilly Publishers, 2007.

B. Voc. [Information Technology] – Semester – V
Core Course – XIV : INFORMATION SECURITY

COURSE CODE : U21IT516 **HOURS PER WEEK : 3**
CREDITS : 3 **TOTAL HOURS : 45**
JOB ROLE : Software Developer (NSQF Level : 7) **COMPONENT : General**

COURSE OBJECTIVES :

To understand the principles and practices of Internet based Information Security Systems.

COURSE OUTCOMES

After the successful completion of this course, the student will be able to

CO No.	Course Outcomes	Level	Units
CO1	Define the basics of Cryptography	K1	I
CO2	Compare the working principle of the Symmetric and Asymmetric Cryptographic Algorithms	K2	II
CO3	Make use of the digital certificates in message communication	K3	III
CO4	Examine the security concepts through secure socket layer	K4	IV
CO5	Evaluate security mechanism through Java and .Net	K5	V
CO6	Discuss the functions of Firewalls, IPSecurity and Virtual Private Networks.	K6	V

UNIT - 1

Need for Security – Security Approaches – Principles of Security – Types of Attacks – **Cryptography:-** Introduction–Plain Text & Cipher Text–Substitution Techniques–Transposition Techniques–Encryption & Decryption–Symmetric & Asymmetric Cryptography–Steganography.

UNIT - 2

Symmetric Key Algorithms:-Algorithm Types and Modes– Overview–DES–IDEA–RC4–RC5– AES– **Asymmetric Key Algorithms**:-Overview–RSA Algorithm–Symmetric and Asymmetric Key Cryptography.

UNIT - 3

Digital Signatures: - Introduction – Message Digests – MD5 – SHA – SHA-512 – Message Authentication Code – HMAC - Digital Signature Techniques – **Digital Certificates and Public Key**

Infra Structure: - Digital Certificates – Private Key Management – The PKIX model – Public Key Cryptography Standards

UNIT - 4

Internet Security Protocols: - Basic Concepts – SSL - TLS – SHTTP – TSP – Secure Electronic Transactions (SET)– Electronic Money – Email Security – WAP Security – GSM Security – **User Authentication and Kerberos: -** Authentication Basics – Passwords – Authentication Tokens – Certificate Based Authentication – Biometric Authentication – Kerberos – Key Distribution Centre – Security Handshake Pitfalls – Single Sign On Approaches.

UNIT - 5

Cryptography in JAVA, .NET and OS:- Cryptographic Solution in Java – Microsoft .NET Framework – Cryptographic Toolkits – Security and OS – Database Security – **Network Security, Firewalls and VPN: -** Firewalls – IP Security – Virtual Private Networks – Intrusion.

TEXT BOOK

1. Atul Kahate, "Cryptography and Network Security", 2nd Edition, 6th Reprint, TMH Publications, New Delhi, 2009.

REFERENCE BOOKS

1. William Stallings, "Cryptography and Network Security: Principles and Practices", Fourth Edition, Pearson Education, 2005.
2. Charlie kaufman, Radia Perlman, Mike Speciner, "Network Security – Private Communication in a Public World", 2nd Edition, PHI Publications, 2002.

B. Voc. [Information Technology] – Semester – V
Core Course – XV : PRINCIPLES OF MARKETING

COURSE CODE : U21IT517 **HOURS PER WEEK : 2**
CREDITS : 2 **TOTAL HOURS : 30**
JOB ROLE : Software Developer (NSQF Level : 7) **COMPONENT : General**

COURSE OBJECTIVES :

To understand the basic principles of Marketing and to acquire skills for effective promotion of concepts, commodities and services.

COURSE OUTCOMES

After the successful completion of this course, the student will be able to

CO No.	Course Outcomes	Level	Units
CO1	Demonstrate understanding of marketing terminologies and concepts	K2	I
CO2	Identify wants and environmental factors that shape marketing activities for certain target markets	K3	II
CO3	Demonstrate knowledge of the individual components of a marketing mix	K2	IV
CO4	Make use of knowledge of key business communication strategies within the marketing field	K3	III
CO5	Identify the organizational processes involved in the planning, implementation and control of marketing activities	K3	I
CO6	Apply knowledge of regulatory and ethical factors considered essential to making marketing decision	K3	V

UNIT - 1

Marketing function - Marketing concept - Marketing Management System Objectives and its interfaces with other functions in the organization.

UNIT - 2

Marketing Environment – Demographic, Economic, Physical, Technological, Political- Marketing segmentation, targeting and positioning.

UNIT - 3

Consumer markets and buying behaviour- (terms).

UNIT - 4

Concept of Marketing Mix. - Four P's of Marketing, -Marketing Strategies – Concept of Product Life Cycle- New Product Development Process – Pricing Decisions.

UNIT - 5

Introduction to service marketing: Types of service – Difference between goods & service – problems in service, Bank, Insurance, BPO – Handling complaints – Quality of service..

TEXT BOOKS

1. Philip Kotler, Kevin Lane Keller, **"Marketing Management"** 15th Edn. Pearson Education. 2015.
2. Rajan Saxena, **"Marketing Management"**, Tata McGraw Hill Education Pvt. Ltd., 2009

REFERENCE BOOKS

1. V. S. Ramasamy, S. Namakumari, **"Marketing management"**, 4th Edition, OM Books, 2010.
2. William J Stanton, Michael J Etzel, Bruce J Walker, **"Fundamentals of Marketing"** McGraw Hill, International Edition, 1994.

B. Voc. [Information Technology] – Semester – V
Elective Course – IA : SOFTWARE ENGINEERING

COURSE CODE : U21IT5:1 **HOURS PER WEEK : 3**
CREDITS : 3 **TOTAL HOURS : 45**
JOB ROLE : Software Developer (NSQF Level : 7) **COMPONENT : General**

COURSE OBJECTIVES :

To understand the principles and practices used in Software Development.

COURSE OUTCOMES

After the successful completion of this course, the student will be able to

CO No.	Course Outcomes	Level	Units
CO1	Define size, quality factors and plan organization structure.	K1	I
CO2	Outline the cost estimation of Software.	K2	II
CO3	Identify the requirement specification notations.	K3	II
CO4	Examine the design notations, techniques and considerations.	K4	III
CO5	Determine programming standards and procedures.	K5	IV
CO6	Adapt different testing strategies and quality factors of process models.	K6	V

UNIT - 1

Introduction: Definitions – Size factors – Quality and Productivity Factors – Managerial Issues – **Planning a Software Project:** Introduction – Defining the Problem – Developing a Solution Strategy – Planning and Development Process – Planning an Organizational Structure.

UNIT - 2

Software Cost Estimation: Software Cost Factors – software Cost Estimation Techniques – Staffing Level Estimation – Estimating Software Maintenance Costs – **Software Requirement Definition**: Software Requirement Specification – Formal Specification Techniques – Languages and Processors for Requirements.

UNIT - 3

Software Design: Fundamental Design Concepts – Modules and Modularization Criteria – Design Notations – Design Techniques – Detailed Design Considerations – Real Time and Distributed Systems – Test Plans – Milestones, Walkthroughs and Inspections – Design Guidelines.

UNIT - 4

Implementation Issues: Structured Coding Techniques – Coding Style – Standards and Guidelines Documentation Guidelines. **Modern Programming Language Features:** User-Defined Data Types - Data Abstraction – Exception Handling – Concurrency Mechanisms.

UNIT - 5

Verification and Validation Techniques: Quality Assurance – Walkthroughs and Inspections – Static Analysis – Symbolic Execution – Unit Testing and Debugging – System Testing – Formal Verification – **Software Maintenance**: Enhancing Maintainability During Development – Managerial Aspects – Configuration Management – Source Code Metrics.

TEXT BOOK

1. Richard Fairley, **"Software Engineering Concepts"**, Tata McGraw-Hill Education, 2008.

REFERENCE BOOKS

1. Ian Sommerville, **"Software Engineering"**, 6th Edition, Pearson Education, Delhi, 2005.
2. Douglas Bell, **"Software Engineering for Students-A Programming Approach"**, 4th Edition, Pearson Education, Delhi 2007.

B. Voc. [Information Technology] – Semester – V
Elective Course – IB : SOFTWARE PROJECT MANAGEMENT

COURSE CODE : U21IT5:A **HOURS PER WEEK : 3**
CREDITS : 3 **TOTAL HOURS : 45**
JOB ROLE : Software Developer (NSQF Level : 7) **COMPONENT : General**

COURSE OBJECTIVES :

To know the basics of Software Project Management, responsibilities of Software Project Manager and Risk Management.

COURSE OUTCOMES

After the successful completion of this course, the student will be able to

CO No.	Course Outcomes	Level	Units
CO1	Recall steps involved in project planning.	K1	I
CO2	Outline the cost and risk in project.	K2	II
CO3	Plan the project schedule, manage risk and identify hazards in project.	K3	III
CO4	Analyze how to prioritize and manage and controls the contract.	K4	IV
CO5	Determine the team involved in project.	K5	V
CO6	Build the safety and health of the people involved in project.	K6	V

UNIT - 1

Introduction to Software Project Management Project Definition – Contract Management – Activities Covered By Software Project Management – Overview of Project Planning – Stepwise Project Planning.

UNIT - 2

Project Evaluation: Strategic Assessment – Technical Assessment – Cost Benefit Analysis–Cash Flow Forecasting – Cost Benefit Evaluation Techniques – Risk Evaluation.

UNIT - 3

Activity Planning Objectives – Project Schedule – Sequencing and Scheduling Activities –Network Planning Models – Forward Pass – Backward Pass – Activity Float – Shortening Project Duration –

Activity on Arrow Networks – Risk Management – Nature Of Risk – Types Of Risk – Managing Risk – Hazard Identification – Hazard Analysis – Risk Planning And Control.

UNIT - 4

Monitoring and Control: Creating Framework – Collecting The Data – Visualizing Progress – Cost Monitoring – Earned Value – Priortizing Monitoring – Getting Project Back To Target – Change Control – Managing Contracts – Introduction – Types Of Contract – Stages In Contract Placement – Typical Terms Of A Contract – Contract Management – Acceptance.

UNIT - 5

Managing People And Organizing Teams : Introduction – Understanding Behavior – Organizational Behaviour: A Background – Selecting The Right Person For The Job – Instruction In The Best Methods – Motivation – The Oldman – Hackman Job Characteristics Model – Working In Groups – Becoming A Team –Decision Making – Leadership – Organizational Structures – Stress –Health And Safety – Case Studies.

TEXT BOOK

1. Bob Hughes, Mike Cotterell, **"Software Project Management"**, 4th edition. TMH, 2009

REFERENCE BOOKS

1. Walker Royce, **"Software Project Management"**, Pearson Education, 1998.
2. Pankaj Jalote, **"Software Project Management in Practice"**, Pearson Education, 2002.

B. Voc. [Information Technology] – Semester – V
Elective Course – IC : SOFTWARE TESTING

COURSE CODE : U21IT5:B **HOURS PER WEEK : 3**
CREDITS : 3 **TOTAL HOURS : 45**
JOB ROLE : Software Developer (NSQF Level : 7) **COMPONENT : General**

COURSE OBJECTIVES :

To acquire knowledge on the principles and practices used in Software Testing

COURSE OUTCOMES

After the successful completion of this course, the student will be able to

CO No.	Course Outcomes	Level	Units
CO1	Recall the Software Development Life cycle.	K1	I
CO2	Illustrate the need for testing in software development process.	K2	II
CO3	Identify the needs of system testing.	K3	III
CO4	Analyse test phases and formulate tools for testing.	K4	IV
CO5	Build test plan, manage and report the software developed.	K6	V
CO6	Create test automation tools for programming model.	K6	V

UNIT - 1

Software Development Life Cycle Models: –Phases of Software Project –Quality, Quality Assurance and Quality control–Testing, Verification & Validation–Process Model–Life Cycle Models-**White Box Testing:** What is White Box Testing?–Static Testing–Structural Testing–Challenges-**Black Box Testing:** What is Black Box Testing?– Why Black Box Testing?– When to do Black Box Testing?– How to do Black Box Testing?

UNIT - 2

Integration Testing: What is Integration Testing? – Integration Testing as a Type of Testing – Integration Testing as a Phase of Testing– Scenario testing– Defect Bash- **System and Acceptance Testing:** Overview – Why System Testing? – Functional Vs Non Functional Testing – Functional System Testing – Non Functional Testing – Acceptance Testing – Summary of Testing Phases.

UNIT - 3

Performance Testing: Factors governing Performance Testing – Methodology for Performance Testing – Tools for Performance Testing – Process for Performance Testing **- Regression Testing:** – What is Regression Testing – Types of Regression Testing – When to do Regression Testing – How to do Regression Testing – Best Practices in Regression Testing.

UNIT - 4

Internationalization (I_{18}n) Testing:- Primer – Test Phases – Enabling Testing – Locale Testing – Validation – Language Testing – Localization Testing – Tools – Challenges and Issues – **Ad hoc Testing: -** Overview – Buddy Testing – Pair Testing – Exploratory Testing – Iterative Testing – Agile and Extreme Testing – Defect Seeding – **Usability and Accessibility Testing: -** What is Usability Testing? – Approach – When to do Usability Testing? – How to Achieve Usability? – Quality Factors – Aesthetics Testing – Accessibility Testing – Tools – Lab Setup – Test Roles

UNIT - 5

Test Planning, Management, Execution and Reporting:-Test Planning-Test Management–Test Process– Test Reporting – Best Practices **- Software Test Automation:** What is Test Automation – Terms used in Automation–Skills Needed for Automation–What to Automate, Scope of Automation–Design & Architecture for Automation– Generic Requirement for Test Tool Framework– Process model for Automation– Selecting a Test tool– Automation for Extreme Programming Model– Challenges in Automation.

TEXT BOOK

1. Srinivasan Desikan, Gopalaswamy Ramesh, **"Software Testing – Principle & Practices"**, Pearson Education, New Delhi, 2006.

REFERENCE BOOKS

1. Ron Patton, **"Software Testing"**, 2nd Edition, Pearson Education, New Delhi, 2006.
2. William E. Perry, **"Effective Methods for Software Testing"**, 3rd Ed., Wiley India, 2006.
3. Renu Rajani, Pradeep Oak, **"Software Testing – Effective Methods, Tools and Techniques"**, TMH Publishing Company Limited, New Delhi, 2004.

B. Voc. [Information Technology] – Semester – V
Core Practical Course – IX : WEB DEVELOPMENT LAB

COURSE CODE : U21ITP09 **HOURS PER WEEK : 4**
CREDITS : 4 **TOTAL HOURS : 60**
JOB ROLE : Software Developer (NSQF Level : 7) **COMPONENT : Skill**

COURSE OBJECTIVES :

To acquire hands on training in programming for the world wide web.

COURSE OUTCOMES

After the successful completion of this course, the student will be able to

CO No.	Course Outcomes	Level	Exercises
CO1	Build web pages using basic HTML and tables	K3	1 – 3
CO2	Make use of hyperlinks, images and image maps	K3	4 – 6
CO3	Examine the concepts of Lists, frames, CSS and Forms	K4	7 – 10
CO4	Interpret the concepts to create shopping mall website, job seeker application and email registration forms with appropriate validations	K5	11 – 14
CO5	Build a database applications in ASP.NET to manage and manipulate data	K5	15-19
CO6	Create web portal for college, application for Bharathidasan university and create first web service	K6	20

1. Create a web page employing the Basic Tags
2. Design a web page using different Heading Styles.
3. Employ different types of Text Formatting.
4. Design a web page with Tables.
5. Create a web page with Hyperlinks.
6. Create a web page with Images.

7. Design a web page involving Image Maps.
8. Design a web page employing Lists.
9. Create a web page with Frames.
10. Design a web page employing Inline Cascaded Style Sheets.
11. Create a web page using Internal CSS.
12. Develop a web page by linking External CSS.
13. Create a Registration Form using HTML tags.
14. Create a website for shopping mall.
15. Using Java Script perform Arithmetic Operations in a web page.
16. Create a program using Java Script functions.
17. Using Java Script strings perform sorting and text manipulation.
18. Write Java Script code using string functions.
19. Develop a Calculator Using Java Script.
20. Perform Form Validations Using Java Script.

B. Voc. [Information Technology] – Semester – V
Core Practical Course – X : PHP and MySQL LAB

COURSE CODE : U21ITP10 **HOURS PER WEEK : 4**
CREDITS : 4 **TOTAL HOURS : 60**
JOB ROLE : Software Developer (NSQF Level : 7) **COMPONENT : Skill**

COURSE OBJECTIVES :
To obtain hands on training in Web Programming with PHP & MySQL.

COURSE OUTCOMES
After the successful completion of this course, the student will be able to

CO No.	Course Outcomes	Level	Exercises
CO1	Identify the concept to read, understand and the execution of PHP Programming	K3	1-2
CO2	Illustrate the use of operators and expressions to solve the problems	K3	3-4
CO3	Apply the Neural Networks with Supervised Learning	K4	5
CO4	Execute programs with appropriate function statements to solve the problems.	K5	8,9
CO5	Use HTML, hashing function in programs to solve the problems. and Demonstrate accessing MySQL using PHP.	K5	10-15
CO6	Create cookies, sessions and Authentication in PHP	K5	16-20

1. Write a PHP program to compute the number of days in a month.
2. Write a PHP program for sorting numbers.
3. Write a PHP program for sorting names.
4. Write a PHP function to reverse an integer and a string.
5. Write a PHP function to test given character is lower or upper case

6. Write a PHP program to search a word in a given text
7. Write a PHP program to check a given number is Palindrome.
8. Write a PHP program to test the string functions
9. Develop a Home page for College
10. Develop a program and check File System functions, Network functions, Date and time functions.
11. Develop a program and check message passing mechanism between pages.
12. Write a program and check Regular Expression, HTML functions, Hashing functions.
13. Write a program to download a file from the server.
14. Develop a web page for user registration with suitable validations
15. Write a program to store the current date and time in a COOKIE and display the 'Last Visited' date and time on the web page.
16. Write a program to store page views count in SESSION, to increment the count on each refresh and to show the count on web page.
17. Write a PHP program to maintain student records using files
18. Write an Inventory program to demonstrate Insertion, Updation and Deletion of rows in MYSQL tables.
19. Write a PHP program using forms to display Employee records stored in MySQL.
20. Develop a college application form using MYSQL table.

B. Voc. [Information Technology] – Semester – V
Core Practical Course – XI : INFORMATION SECURITY LAB

COURSE CODE : U21ITP11 **HOURS PER WEEK : 4**
CREDITS : 4 **TOTAL HOURS : 60**
JOB ROLE : Software Developer (NSQF Level : 7) **COMPONENT : Skill**

COURSE OBJECTIVES :
To acquire experience in securing information in store or on move.

COURSE OUTCOMES
After the successful completion of this course, the student will be able to

CO No.	Course Outcomes	Level	Exercises
CO1	Make use of network programming in Java	K3	1-3
CO2	Develop client sever communication using TCP and UDP	K3	4-10
CO3	Examine the message passing using message window and group window	K4	11-12
CO4	Asses the security level for message passing using substitution techniques	K5	13-14
CO5	Choose the security mechanism using symmetric or asymmetric algorithms	K6	15-16
CO6	Design the security system using One Time Password	K6	17

01. Capturing internet address of local host and remote host using Java Program
02. Write a Java Program to find network ports using port scanner
03. Write a Java Program to implement finger client
04. Implement ping programming using Java.
05. Implement peer to peer communication using UDP
06. Implement socket program for UDP Echo Client and EchoServer
07. Implement Client Server Communication Using TCP

08. Implement Client Server Application for chat
09. Write a Java Program to implement multicasting on a network
10. Write a Java Program to implement Client Server Communication using object stream.
11. Write a Java Program to perform Message passing using Message Window
12. Write a Java Program to perform Message Passing using Group Window
13. Write a Java Program to implement Caesar Cipher technique
14. Write a Java Program to Implement the Monoalphabetic Cipher
15. Write a Java Program to implement Diffie Hellman Key Exchange Algorithm
16. Write a Java Program to implement RSA Algorithm
17. Write a Java Program to implement basic One Time Password

B. Voc. [Information Technology] – Semester – VI
Core Course – XIV : PROGRAMMING WITH PYTHON

COURSE CODE : U21IT618 **HOURS PER WEEK : 3**
CREDITS : 3 **TOTAL HOURS : 45**
JOB ROLE : Software Developer (NSQF Level : 7) **COMPONENT : General**

COURSE OBJECTIVES :
To gain knowledge on programming and problem solving using Python.

COURSE OUTCOMES
After the successful completion of this course, the student will be able to

CO No.	Course Outcomes	Level	Units
CO1	Illustrate the basics of computer programming languages	K2	I
CO2	Apply the concepts of user defined functions	K3	II
CO3	Make use of the built in functions	K3	II
CO4	Classify the built in function of string, List, Tuple and Dictionary.	K4	III
CO5	Determine the Importance of file programs and Exceptions handling	K5	IV
CO6	Develop programs using classes and Objects	K6	V

UNIT - 1
Introduction to Python: Introduction–Python Overview–Getting started with python–Comments–Python Identifiers–Reserved Keywords–Variables–Standard Data Types–Operators–Standard and Expressions–String Operations – Boolean Expressions – Control Statements – Iteration – Input from Keyboard.

UNIT - 2
Functions: Introduction – Built-in Functions – Composition of Functions – User Defined Functions – Parameters and Arguments – Function Calls – The return statement – Python Recursive functions – The anonymous functions – Writing python scripts

UNIT - 3
Strings and Lists: Strings – Compound Data type – len Function – String Slices – Strings are Immutable – String Traversal – Escape Characters – String Formatting Operator – String Formatting Functions - Lists

– Values and accessing elements – Lists are Mutable – Traverse – Deleting elements from list – Built-in list operators – Built-in List methods - Tuples and Dictionaries: Tuples – Creating Tuples – Accessing values in Tuples – Basic Tuple Operations – Built-in Tuple Functions - Dictionaries.

UNIT - 4

Files and Exceptions: Text Files– Opening a File– Closing a File– File Object Attributes– Reading from a file– Writing to a file– Renaming a file– Deleting a file– File related methods- Directories– Exceptions– Built-in Exceptions – Handling Exceptions - Exception with arguments – User defined Exceptions

UNIT - 5

Classes and Objects: Overview of OOP – Class Definition – Creating Objects – Objects as Arguments – Objects as Return values – Built-in class attributes – Inheritance – Method Overriding – Data Encapsulation – Data Hiding.

TEXT BOOK

1. Balagurusamy E, "Introduction to Computing and Problem Solving Using Python", 1st Edition, McGraw Hill Education(India) Private Limited, 2017.

REFERENCE BOOKS

1. Reema Thareja, "Python Programming using Problem Solving Approach", Oxford University Press, 2017.
2. Ashok Namdev Kamthane and Amit Ashok Kamthane, "Programming and Problem Solving with Python", McGrawHill Education, November 2017.
3. Mark Lutz, "Learning Python", O'Reilly, Shroff Publishers & Distributors Private Ltd., June 2017.

B. Voc. [Information Technology] – Semester – VI
Core Course – XV : INTERNET OF THINGS

COURSE CODE : U21IT619 | **HOURS PER WEEK : 3**
CREDITS : 3 | **TOTAL HOURS : 45**
JOB ROLE : Software Developer (NSQF Level : 7) | **COMPONENT : General**

COURSE OBJECTIVES :

To understand the underlying concepts in Internet of Things (IoT) and to acquire knowledge on state of the art in the IoT, its challenges and future directions.

COURSE OUTCOMES

After the successful completion of this course, the student will be able to

CO No.	Course Outcomes	Level	Units
CO1	Demonstrate the designs and levels of IoT	K2	I
CO2	Identify Domain Specific IoTs	K3	II
CO3	Utilize IoT and M2M	K3	II
CO4	Discover IoT design methodology, Devices and Endpoints	K4	III
CO5	Interpret IoT design using case studies	K5	IV
CO6	Elaborate Data analytics for IoT and Tools for IoT	K6	V

UNIT - 1

Introduction to Internet of Things: Introduction – Physical Design of IoT – Logical Design of IoT – IoT Enabling Technologies – IoT Levels & Deployment Templates.

UNIT - 2

Domain Specific IoTs: –Introduction – Home automation – Cities – Environment – Energy – Retail – Logistics – Agriculture – Industry – Health & Lifestyle – IoT and M2M: Introduction – M2M – Difference between IoT and M2M – SDN and NFV for IoT – Software Defined Networking – Network Function Virtualization.

UNIT - 3

IoT Platforms Design Methodology: Introduction – IoT Design Methodology – IoT Physical Devices and Endpoints: – What is an IoT device – Exemplary Device: Raspberry Pi – About the Board – Linux on Raspberry Pi – Raspberry Pi Interfaces – Programming Raspberry Pi with Python – Other IoT devices.

UNIT - 4

Case Studies Illustrating IoT Design: Introduction – Home Automation – Smart Lighting – Home Intrusion Detection – Cities – Smart Parking – Environment –Weather Monitoring System – Weather Reporting Bot – Air Pollution Monitoring – Forest Fire Detection – Agriculture – Smart Irrigation – Productivity Applications.

UNIT - 5

Data Analytics for IoT: Introduction – Apache Hadoop – Using Hadoop MapReduce for Batch Data Analysis – Apache Oozie – Apache Spark – Apache Storm – Using Apache Storm for Real-time data analysis. Tools for IoT: Introduction – Chef – Chef case studies – Puppet – Puppet case study.

TEXT BOOK:

1. Arshdeep Bahga, Vijay Madisetti, "Internet of Things – A Hands-on Approach", Universities Press(India) Private Limited, 2016.

REFERENCE BOOKS

1. Peter Waher, "Learning Internet of Things", PACKT Publishing, 2015.
2. Cuno Pfister, "Getting Started with the Internet of Things", O'Rielly Publication.
3. Francis DaCosta, "Rethinking the Internet of Things-A Scalable Approach to Connecting Everything", Apress open publication, 2013 Edition.

B. Voc. [Information Technology] – Semester – VI
Core Course – XVI : ENTREPRENEURIAL DEVELOPMENT

COURSE CODE : U21IT620 **HOURS PER WEEK : 2**
CREDITS : 2 **TOTAL HOURS : 30**
JOB ROLE : Software Developer (NSQF Level : 7) **COMPONENT : General**

COURSE OBJECTIVES :

To understand the principles for developing Entrepreneurial Skills

COURSE OUTCOMES

After the successful completion of this course, the student will be able to

CO No.	Course Outcomes	Level	Units
CO1	Define, identify and/or apply the principles of Entrepreneurship and family business	K2	I
CO2	Develop the principles of viability of businesses, new businesses proposals, and opportunities within existing businesses.	K6	II
CO3	Build their interpersonal and collaborative skills	K6	II
CO4	Compile the principles of Entrepreneurial Management and growth through Strategic Plans, Feasibility Analysis and Pilot Study	K6	III
CO5	Propose the concept of consulting projects and/or implementing their own businesses	K6	IV
CO6	Design the principles of preparing a startup business plan emphasizing financing, marketing and organizing	K6	V

UNIT - 1

Definition of Entrepreneur – Importance of Entrepreneurship in underdeveloped Economics – Constraints in underdeveloped Countries to Entrepreneurship – Sociological and Psychological factors of Entrepreneurship Achievement - Motivation and Methods of improving a person.

UNIT - 2

Why and How to be a Entrepreneur? - Factors to consider when selecting a project and its location – Technical Feasibility, Market Feasibility, Importance of market survey and how to do it.

UNIT - 3

Economic Feasibility – Planning the project – Essentials of a project report of a business – Counseling facilities available for technical training and project formulation - Choosing the scale of business.

UNIT - 4

Managerial skills required by entrepreneurs and methods of acquiring them – Role of management consultant – Different types of credit required by a firm, seed capital, venture capital, fixed capital, working capital, packing and export credit, and sources of these. Benefits of leasing.

UNIT - 5

Problems faced by rural Women Entrepreneurs – Emerging Trend – SHG's and KVIC's suitable for Handicapped Persons – Problems of Family Business – Prevention of Industrial Pollution of air and water around the business unit – causes and prevention of industrial sickness, Emerging trends in IT industry, BPOs / ITES/STPs.

TEXT BOOK

1. P. Saravanavel, **"Entrepreneurship Development Principles, Policies and Programmes"**, Ess Pee Kay Publishing House, Chennai, 1997.

REFERENCE BOOKS

1. Vasanth Desai, **"Dynamics of Entrepreneurial Development"**, Himalaya Publishing House, 2011.
2. S B Srivastavan, **"A practical guide to Industrial Entrepreneur"**, Sultan Chand & Sons, 1981.
3. Gupta, Srinivasan, **"Entrepreneur Development"**, Sultan Chand & Sons, 2014.

B. Voc. [Information Technology] – Semester – VI
Elective Course – 2A : WEB SERVICE TECHNOLOGIES

COURSE CODE : U21IT6:2 **HOURS PER WEEK : 3**
CREDITS : 3 **TOTAL HOURS : 45**
JOB ROLE : Software Developer (NSQF Level : 7) **COMPONENT : General**

COURSE OBJECTIVES :

To know the concepts and applications associated with Web Services.

COURSE OUTCOMES

After the successful completion of this course, the student will be able to

CO No.	Course Outcomes	Level	Units
CO1	Illustrate the importance of web service and fundamentals of XML	K2	I
CO2	Explain the Messages and encoding through Simple Object Access Protocol (SOAP) Web Services Description Language (WSDL) and Universal Description Discovery and Integration (UDDI)	K2	I
CO3	Classify SOAP and WSDL	K2	II
CO4	Develop the Web Services Conversation Language (WSCL) implement the business level conversations or public processes	K6	III4
CO5	Evaluate workflow with Business Process Execution Language (BPEL)	K6	IV
CO6	Build the Organization for the Advancement of Structured Information Standard (OASIS) using Business Transaction Protocol	K3	V

UNIT - 1

Introduction: Overview of web services – SOAP, WSDL, UDDI – Importance of Web Services – Web services and enterprises – **XML Fundamentals:** The Lingua Franca of Web Services - XML Documents - XML Namespaces - XML Schema - Processing XML.

UNIT - 2

SOAP and WSDL: - The SOAP Model – SOAP – SOAP Messages – SOAP Encoding – SPOAP RPC – Using Alternate SOAP Encodings – Document, RPC, Literal, Encoded – SOAP Web Services and the REST Architecture – Looking Back to SOAP 1.1 - WSDL – Using SOAP and WSDL .

UNIT - 3

UDDI: - UDDI at a glance – UDDI Business Registry – UDDI under the covers – Accessing UDDI – How UDDI is Playing Out. **Conversations: -**Overview–Web Services Conversation Language–WSCL Interface Components– Relationship Between WSCL and WSDL.

UNIT - 4

Workflow: -Business Process Management–Workflows and Workflow Management System – Business Processing Language for Web Services (BPEL) **Transactions:-** ACID Transactions – Distributed Transactions and Two Phase Commit – Dealing with Heuristic Outcomes – Scaling Transactions to Web Services.

UNIT - 5

Transactions: OASIS Business Transaction Protocol - Other Web Service Transaction Protocols. **Security :** Everyday Security Basics - Security Is An End-to-End Process - Web Service Security Issues - Types of Security Attacks and Threats - Web Services Security Roadmap - WS-Security. **Real World Web Service Application Development-Foundations: -** Enterprise Procurement – System Functionality and Architecture – Running the EPS Application.

TEXT BOOK

1. Sandeep Chatterjee, James Webber, **"Developing Enterprise Web Services – An Architect's Guide"**, Pearson Education, 2004.

REFERENCE BOOK

1. Frank. P. Coyle, **"XML, Web Services and The Data Revolution"**, Pearson Education, 2002.

B. Voc. [Information Technology] – Semester – VI
Elective Course – 2B : OPEN SOURCE TECHNOLOGIES

COURSE CODE : U21IT6:A **HOURS PER WEEK : 3**
CREDITS : 3 **TOTAL HOURS : 45**
JOB ROLE : Software Developer (NSQF Level : 7) **COMPONENT : General**

COURSE OBJECTIVES :

To acquire knowledge on Open Source Technologies involving Linux, Apache, MySQL and Perl.

COURSE OUTCOMES

After the successful completion of this course, the student will be able to

CO No.	Course Outcomes	Level	Units
CO1	Explain the Overview of Linux and Unix	K2	I
CO2	Develop the Apache Web Server using with open source Software	K3	II
CO3	Distinguish between Perl and MySQL commands.	K3	III
CO4	Classify the Website META Language for project creations	K4	IV
CO5	Interpret the Common Gateway using with Apache Configuration and programming with Perl	K5	IV
CO6	Build the Mason configuration with the Mason project	K6	V

UNIT - 1

Introduction: - Open Source Software – Web Explained - Working – Security – **Linux: -** Overview – Basic UNIX

UNIT - 2

Apache Web Server: - Introduction – Starting, Stopping and Restarting Apache – Configuration – Securing Apache – Web Site Creation – Apache Log Files.

UNIT - 3

Perl : - Introduction – Perl Documentation – Perl Syntax Rules – Introduction to Object Oriented Programming – **MySQL: -** Introduction – Commands - SHOW DATABASES - CREATE DATABASES – USE – CREATE TABLE – SHOW TABLES – DESCRIBE – INSERT – SELECT – UPDATE –

DELETE – Administrative Details – Database Independent Interface – Table Joins – Loading and Dumping Database.

UNIT - 4

Website META Language: - Introduction – Installation – Basics – Creating a Template – Other Helpful Includes – Diversion – A Better Template – Configuring WML with .wmlrc – MACROS-Creating Custom Tags – Programming Code – eperl – Project Creation – **Common Gateway Interface: -** Introduction – Apache Configuration – First CGI Program – Introduction of CGI.pm – CGI.pm HTML Shortcuts – Information Received by the CGI Program - Form Widget Methods – CGI Security Considerations – die() function – **mod-Perl: -** Introduction – Configuration – Turning CGIs into mod-perl Programs – Pure mod-perl Programming.

UNIT - 5

Server Side Includes: - Introduction – Security Considerations – **Embperl (HTML::Embperl):** – Introduction – Installation – Apache Configuration – Example Program – Embperl Commands – Posted Data and %fdat – Other Embperl Variables - Embperl Project – **Mason (HTML::Mason):** – Introduction – Installation – Apache Configuration – Example Program – Inline Perl Sections – Handling Posted Data with % ARGS and <%args> - Mason Components – Mason Project

TEXT BOOK

1. James Lee and Brent Ware,**"Open Source Web Development with LAMP using Linux, Apache, MySQL, Perl and PHP"**, Dorling Kindersley(India) Pvt. Ltd, 2009.

REFERENCE BOOK

1. Eric Rosebrock, Eric Filson, **"Setting up LAMP: Getting Linux, Apache, MySQL, and PHP and working Together"**, Published by John Wiley and Sons, 2004.

B. Voc. [Information Technology] – Semester – VI
Elective Course – 2C : DISTRIBUTED COMPUTING TECHNOLOGIES

COURSE CODE : U21IT6:B **HOURS PER WEEK : 3**
CREDITS : 3 **TOTAL HOURS : 45**
JOB ROLE : Software Developer (NSQF Level : 7) **COMPONENT : General**

COURSE OBJECTIVES :

To understand the facilities and technologies available for Distributed Computing.

COURSE OUTCOMES

After the successful completion of this course, the student will be able to

CO No.	Course Outcomes	Level	Units
CO1	Illustrate characterization of Distributed System	K2	I
CO2	Classify Networks and Apply Ethernet and WiFi Blutooth	K3	I
CO3	Develop Distributed objects and remote Invocation and Java RMI	K3	II
CO4	Test for Sun network File System	K4	III
CO5	Interpret and Evaluate the Global name service	K5	IV
CO6	Discuss Transaction using in distributed computing technology	K6	V

UNIT - 1

Characterization of Distributed Systems – Examples – Resource Sharing and the Web – Challenges – System Models – Architectural and Fundamental Models – Networking and Internetworking – Types of Networks – Network Principles – Internet Protocols – Case Studies: Etherent, WiFi, Bluetooth.

UNIT - 2

Interprocess Communication – The API for the Internet Protocols – External Data Representation and Marshalling – Client– Server Communication – Group Communication – Case Study – Distributed Objects and Remote Invocation – Communication between Distributed Objects – Remote Procedure Call – Events and Notifications– Case Study: Java RMI

UNIT - 3

The OS Layer– Protection– Processes and Threads– Communication and Invocation– OS Architecture– Security–Security Techniques–Cryptographic Algorithms–Digital Signatures–Cryptography Pragmatics– Case Studies – Distributed File Systems – File Service Architecture – Sun Network File System.

UNIT - 4

Name Services – Domain Name System – Discovery Services – Case Study: Global Name Service , X.500 Directory Service – Clocks , Events and Process States – Synchronizing Physical Clocks – Logical Time and Logical Clocks – Global States – Distributed Debugging – Distributed Mutual Exclusion – Elections – Multicast Communication.

UNIT - 5

Transactions – Nested Transactions – Locks – Optimistic Concurrency Control – Timestamp Ordering – Comparison – Flat and Nested Distributed Transactions – Atomic Commit Protocols – Concurrency Control in Distributed Transactions – Distributed Deadlocks – Transaction Recovery – Replication and Distributed Multimedia Systems.

TEXT BOOK

1. George Coulouris, Jean Dollimore, Tim Kindberg, **"Distributed Systems Concepts and Design"**, 4th Edition, Pearson Education, 2009.

REFERENCE BOOK

1. Albert Fleishman, **"Distributed Systems Software Design and Implementation"**, Springer Verlag, 2004.
2. M. L .Liu, **"Distributed Computing Principles and Applications"**, Pearson Education, 2004.

B. Voc. [Information Technology] – Semester – VI
Core Practical Course – XII : MULTIMEDIA LAB

COURSE CODE : U21ITP12 **HOURS PER WEEK : 4**
CREDITS : 4 **TOTAL HOURS : 60**
JOB ROLE : Software Developer (NSQF Level : 7) **COMPONENT : Skill**

COURSE OBJECTIVES :

To obtain hands on training required to handle various components of Multimedia such as text, graphics, animation, audio and video.

COURSE OUTCOMES

After the successful completion of this course, the student will be able to

CO No.	Course Outcomes	Level	Exercises
CO1	Design layouts for web pages, Paper Adverts, Broachers Covers and Package designing	K3	1-2
CO2	Use layered Photoshop document from a starting image	K3	3-4
CO3	Test the transforming and retouching images	K4	5
CO4	Create Website, animated graphics, add sound and teractivelyin Adobe Flash	K5	8,9
CO5	Apply Professional audio workstation used to mix, edit and create digital Audio in adobe Audition.	K5	10
CO6	Demonstrate film maker, editors, to combine video audio and still images	K5	10-12

1. Working with Text and Styles.

2. Creating shapes and painting (Using Drawing tool, Pen tool, Painting tools, and Brush tools).

3. Working with Image size and Resolution.

4. Working with Layers.
5. Transforming and Retouching Images (Cropping, Transforming objects, Clone stamping, Retouching).
6. Working with color Adjustments on Image.
7. Creating Frame-by-Frame Animation & Tweened Animation–(motion tween and shape tween).
8. Working with textual effects.
9. Creating buttons and working with scenes.
10. Creating animation with sound.
11. Recording, Editing and Mixing audio clips.
12. Capturing, Editing and Rendering video clips.

B. Voc. [Information Technology] – Semester – VI
Core Practical Course – XIII : PYTHON PROGRAMMING LAB

COURSE CODE : U21ITP13 **HOURS PER WEEK : 4**
CREDITS : 4 **TOTAL HOURS : 60**
JOB ROLE : Software Developer (NSQF Level : 7) **COMPONENT : Skill**

COURSE OBJECTIVES :
To enrich programming and problem solving skills with python programming.

COURSE OUTCOMES
After the successful completion of this course, the student will be able to

CO No.	Course Outcomes	Level	Exercises
CO1	Apply the basic concepts of programming using Python	K3	1-6
CO2	Construct the program using built in functions of List and String	K3	7-13
CO3	Test for mapping using Dictionary	K4	14-16
CO4	Asses the execution speed of the program using recursion	K5	17-19
CO5	Evaluate the basic operations of file creation	K5	20-22
CO6	Build the program using Object Oriented Concepts	K6	23-25

1. Write a program to calculate the average of numbers in a given list.
2. Write a program to accept three digits and print all possible combinations from the digits.
3. Write a program to count number of digits in a number.
4. Write a program to compute prime factors of an integer.
5. Write a program to find LCM and GCD of two numbers.
6. Write a program to check if a number is a perfect number.
7. Write a program to remove the duplicate items from a list.
8. Write a program to find union and intersection of two lists.

9. Write a program to swap the first and last value of a list.
10. Write a program to count the number of vowels in a string.
11. Write a program to calculate the number of digits and letters in a string.
12. Write a program to form a new string by exchanging the first and the last characters.
13. Write a program to add a key-value pair to the dictionary.
14. Write a program to map two lists into dictionary.
15. Write a program to sum all the items in a dictionary.
16. Write a program to check common letters in two input strings.
17. Write a program to find the Fibonacci series using recursion.
18. Write a program to flatten a nested list using recursion.
19. Write a program to find the length of a list using recursion.
20. Write a program to count the number of words in a text file.
21. Write a program to copy the contents of one file into another.
22. Write a program to read the contents of a file in reverse order.
23. Write a program to append, delete and display elements of a list using classes.
24. Write a program to create a class which performs basic calculator operations.
25. Write a program to create a class and get all possible subsets from a set of distinct integers.

B. Voc. [Information Technology] – Semester – VI
Core Practical Course – XIV : INTERNET OF THINGS LAB

COURSE CODE : U21ITP14 | **HOURS PER WEEK : 4**
CREDITS : 4 | **TOTAL HOURS : 60**
JOB ROLE : Software Developer (NSQF Level : 7) | **COMPONENT : Skill**

COURSE OBJECTIVES :
To gain experience in working with IoT Applications.

COURSE OUTCOMES
After the successful completion of this course, the student will be able to

CO No.	Course Outcomes	Level	Exercises
CO1	Build an interface to toggle LED with delay	K3	1
CO2	Make use of LED dimmer and weather Monitoring	K3	2 – 3
CO3	Examine the temperature data to show in LCD display and controlling DC motor	K4	4 – 5
CO4	Interpret the time in seven segment display and display sensor data in a web application	K5	6 – 7
CO5	Build a home appliances control with IR and send sensor data to cloud	K5	8 – 9
CO6	Create an indoor air quality and garbage monitoring system	K6	10

1. Interfacing LED to Toggle with delay
2. LED Dimmer using Pulse Width Modulation
3. Weather Monitoring using DHT11
4. Display Temperature Data with LCD interfacing
5. DC Motor Controlling.
6. Time Display using 7-Segment Display

7. Display Sensor Data using Web Application
8. Home Appliances control with IR Receiver using IR-Remote.
9. Sending Sensor Data to Thing-Speak Cloud
10. Indoor Air-Quality and Garbage Monitoring System

Department of Information Technology
Bishop Heber College (Autonomous)
Tiruchirappalli - 620017

EXTRA CREDIT COURSES

B. Voc. [Information Technology]

(for students admitted from the academic year 2021-2022 onwards)

B. Voc. [Information Technology] – Semester - IV
Extra Credit Course – I : PRINCIPLES OF USER EXPERIENCE DESIGN

COURSE CODE : **HOURS PER WEEK :**
CREDITS : 2 **TOTAL HOURS :**

COURSE OBJECTIVES :
To acquire exposure on the application of design learning to real-life situations, where communication and collaboration are vital.

COURSE OUTCOMES:
After the successful completion of this course, the student will be able to

CO. No.	Course Outcomes	Level	Unit
CO1	Recall the concepts of User Experience Design.	K1	I
CO2	Outline the tools and techniques used in Research.	K2	II
CO3	Construct the site map and prototypes.	K3	III
CO4	Organize the content, patterns and Layout of the page.	K3	III
CO5	Determine trees, charts and design forms for user input.	K5	IV
CO6	Develop mobile and desktop applications.	K6	V

UNIT - 1
The Tao of UXD: What Is User Experience Design – About UX Designers – Where UX Designers Live? **The Project Ecosystem:** Identify the Type of Site - Choose Your Hats. **Proposals for Consultants and Freelancers:** Proposals - Creating the Proposal - Statements of Work. **Project Objectives and Approach:** Solidify Project Objectives - Understand the Project Approach.

UNIT - 2
User Research: Choosing Research Techniques. **Site Maps and Task Flows**: What Is a Site Map? - What Is a Task Flow? - Tools of the Trade - Basic Elements of Site Maps and Task Flows - Common Mistakes - Advanced Site Maps - Breaking the Site Map Mold - Task Flows - Taking Task Flows to the Next Level. **Wireframes and Annotations:** What Is a Wireframe? - What Are Annotations? - Who Uses Wireframes? - Start Simply: Design a Basic Wireframe. **Prototyping:** What Is Prototyping? - How Much Prototype Do I Need? - Paper Prototyping - Digital Prototyping - Prototype Examples.

UNIT - 3

Organizing the Content: Information Architecture and Application Structure: The Big Picture - The Patterns. **Getting Around: Navigation, Signposts, and Wayfinding:** Staying Found - The Cost of Navigation - Navigational Models - Design Conventions for Websites - The Patterns. **Organizing the Page: Layout of Page Elements:** The Basics of Page Layout - The Patterns.

UNIT - 4

Doing Things: Actions and Commands: Pushing the Boundaries- The Patterns. **Showing Complex Data: Trees, Charts, and Other Information Graphics:** The Basics of Information Graphics- The Patterns. **Getting Input from Users: Forms and Controls:** The Basics of Form Design-Control Choice-The Patterns.

UNIT - 5

Using Social Media: The Basics of Social Media - The Patterns. **Going Mobile**: The Challenges of Mobile Design -The Patterns **Making It Look Good: Visual Style and Aesthetics:** The Basics of Visual Design - What This Means for Desktop Applications - The Patterns.

TEXT BOOKS :

1. Russ Unger and Carolyn Chandler, "**A Project Guide to UX Design - For user experience designers in the field or in the making**", New Riders is an imprint of Peach pit, a division of Pearson Education, 2009 Edition. (For Units – 1 and 2)
2. Jenifer Tidwell, "**Designing Interfaces**", 2nd Edition, Published by O'Reilly Media. (For Units 3, 4 & 5)

REFERENCE BOOKS :

1. Alan Cooper, Robert Remann and David Cronin **"The Essentials of Interaction Design"** 4th Edition.
2. David J Bland, Alexander **Osterwalder** "Testing Business Ideas: A Field Guide for Rapid Experimentation", **Kindle Edition.**

B. Voc. [Information Technology] – Semester - V
Extra Credit Course – II : BIG DATA ANALYTICS

COURSE CODE : **HOURS PER WEEK :**
CREDITS : 2 **TOTAL HOURS :**

COURSE OBJECTIVES :

To obtain knowledge in Data Mining concepts and techniques and to understand the Big Data basics and the Analytics for Enterprise class Hadoop

COURSE OUTCOMES

After the successful completion of this course, the student will be able to

CO. No.	Course Outcomes	Level	Unit
CO1	Interpret the importance of data mining.	K2	I
CO2	Organize and prepare the data needed for data mining using preprocessing techniques.	K3	II
CO3	Examine the basic principles, concepts and applications of data warehousing and data mining.	K4	III
CO4	Analyze the Conceptual, Logical, and Physical design, Data Warehouses, OLAP applications and OLAP deployment.	K4	III
CO5	Criticize Infosphere Big Insights and Big Data Recommendations.	K5	IV
CO6	Build on Big data application Using Pig and Hive.	K6	V

UNIT - 1

Introduction to Big Data: Characteristics & Types of Digital Data-Unstructured, Semi-Structured and Structured-Introduction to Big Data-Sources of Big Data-Characteristics and Necessity of Big Data–Big Data Terminologies – Big Data Architecture - Challenges of Big Data – Data Environment Vs Big Data Environment – Data in Data warehouse Vs Hadoop Environment - Key Roles for the New Big Data Ecosystem - Big Data Applications.

UNIT - 2

Introduction to Big Data Analytics: Big Data Analytics - Business Intelligence Vs Data Science, Different types of Analytics: Current Analytical Architecture, Drivers of Big Data, Emerging Big Data Ecosystem and a New Approach to Analytics – Classification of Analytics – Data Analytics Life Cycle – IBM Big Data Strategy - Data Scientist: Skills and Responsibilities.

UNIT - 3

Big Data Management: Introduction to NoSQL Database– Features – Types of NoSQL Database – Merits and Demerits of NoSQL – Applications – Introduction to NewSQL , MangoDB and Apache Cassandra– Needs and Characteristics - SQL Vs NoSQL Vs NewSQL. **Big Data Use Cases:** Patterns for Big Data Deployment: IT for IT Log Analytics, Fraud Detection Pattern, the Social Media Pattern, Big Data and Energy Sector, Risk Patterns for Modelling and Management.

UNIT - 4

Introduction to Hadoop: Features–Advantages–Versions–Hadoop Ecosystem–Hadoop Architecture-Hadoop Distributions – Hadoop Vs SQL – RDBMS Vs Hadoop. **Big Data: From the Technology Perspective:** Application Development in Hadoop: Pig and PigLatin – Hive – Jaql – Getting Data into Hadoop: Basic Copy Data – Flume – Other Hadoop Components: Zookeeper – Hbase – Oozie –Lucene – Avro.

UNIT - 5

Hadoop Distributed File System: Design – Concepts – Command Line Interface- Hadoop File System: Interfaces: HTTP, C and FUSE. MapReduce – Types- Input and Output Formats – Features. Introduction to YARN: Components – Applications. Data Serialization in Hadoop.

TEXT BOOKS:

1. Jiawei Han and Micheline Kamber**, "Data Mining Concepts and Techniques",** Morgan Kaufmann Publishers, An imprint of Elsevier, 2006, Second Edition (for units 1, 2 and3)
2. Paul C. Zikopoulos, Chris Eaton, Dirk deRoos, Thomas Deutsch, George Lapis **"Understanding Big Data:Analytics for Enterprise Class Hadoop and Streaming Data",** McGraw-Hill, 2012. (for Units 4 &5)

REFERENCE BOOKS:

1. Radha Shankaramani and M.Vijayalakshmi **"Big Data Analytics",** Wiley,2nd Edition, 2016.
2. Charu C. Aggarwal **"Data Mining",** Springer.

B. Voc. [Information Technology] – Semester - VI
Extra Credit Course – 3 : HUMAN COMPUTER INTERACTION

COURSE CODE : **HOURS PER WEEK :**
CREDITS : 2 **TOTAL HOURS :**

COURSE OBJECTIVES :

To understand the facilities and technologies available for interaction between Human Beings and Computers.

COURSE OUTCOMES

After the successful completion of this course the students will be able to

CO. No.	Course Outcomes	Level	Unit
CO1	Show HCI, User interface software tools, Models, Theories, and Frameworks	K2	I
CO2	Explain Usability Engineering Methods and Concepts	K2	II
CO3	Apply HCI techniques and concepts for software design	K3	II
CO4	Motivate Groupware and Cooperative Activity	K4	III
CO5	Estimate Media and Information	K5	IV
CO6	Elaborate Integrating Computation and Real Environments	K6	V

UNIT - 1

Models, Theories, and Frameworks : A Effective Use and Reuse of HCI Knowledge – Macrotheory for System of Interactors – Design in the MoRAS – Distributed Cognition : Toward a New Foundation for Human-Computer Interaction Research. – **User Interface Software and Tools : -** Past, Present, and Future of User Interface Software Tools – Creating Creativity : User Interfaces for Supporting Innovations – Interaction Spaces for Twenty-First-Century Computing.

UNIT - 2

Usability Engineering Methods and Concepts : - The Strategic Use of Complex Computer Systems – User Interface Evaluation : How Cognitive Models can Help – HCI in the Global Knowledge-Based Economy : Designing to Support Worker Adaptation – A Reference Task Agenda for HCI – The Maturation of HCI: Moving beyond Usability toward Holistic Interaction.

UNIT - 3

Groupware and Cooperative Activity : Computer-Mediated Communications for Group Support : Past and Future – The Intellectual Challenge of CSCW : The Gap between Social Requirements and Technical Feasibility – Social Translucence: Designing Systems That Support Social Processes – Transcending the Individual Human Mind : Creating Shared Understanding through collaborative Design – The Development of Cooperation: Five Years of Participatory Design in Virtual School – Distance Matters.

UNIT - 4

Media and Information : : Designing the User Interface for Multimodal Speech and Pen-Based Gesture Applications: State-of-the-Art Systems and Future Research Directions – Technologies of Information : HCI and Digital Library – Interface that Give and Take Advice – Beyond Recommender Systems : Helping People Help Each Other.

UNIT - 5

Integrating Computation and Real Environments : - Charting Past, Present, and Future Research in Ubiquitous Computing – Situated Computing : The Next Frontier for HCI Research – Roomware : Toward the Next Generation of Human – Computer Interaction based on an Integrated Design of Real and Virtual Worlds. – Emerging Framework for Tangible User Interfaces – **HCI and Society** : Learner-Centered Design : Reflections and New Directions – HCI Meets the "Real World" : Designing Technologies for Civic Sector Use – Beyond Blowing Together : Socio Technical Capital.

TEXT BOOK:

1. John M. Carroll, "Human Computer Interaction–in the New Millennium", Pearson Education, 2007.

REFERENCE BOOK:

1. Alan Dix, Janet Finlay, Gregory D. Abowd, Russell Beale, "Human-Computer Interaction", Pearson Education, 2009.