

MANGALORE UNIVERSITY

**Revised
Curriculum and Scheme of Examinations**

**B.Com. - Computer
Applications (Vocational) Degree
Programme**

**Choice Based Credit System (CBCS),
2019-2020 onwards**

MANGALORE UNIVERSITY
B.Com. - Computer Applications (Vocational) Degree Programme
Curriculum and Scheme of Examinations

T- Theory P - Practical, CC- Co-Curricular, EC – Extra-curricular

I / II/III/IV Semesters

Courses Group	Courses	No. of Courses T/P	Instruction Hours/Week	Duration of Exam(hrs)	Marks			Credits
					IA	Exam	Total	
Group 1	2 Commerce courses	1T	1x4	1x3	1x20	1x80	1x100	1x2
		1T	1x6	1x3	1x30	1x120	1x150	1x3
	Computer Application (Vocational Course)	2T	2 x 4	2 x 3	2 x 20	2 x 80	2x100	2x2
		1P	1 x 4	1 x 3	1 x 10	1 x 40	1x 50	1x1
Group 2	One course from 4 Electives	1T	1 x 2	1 x 2	1 x 10	1 x 40	1 x 50	1x1 =1
Group 3	2 Languages	2L	2 x 4	2 x 3	2 x 20	2 x 80	2 x 100	2 x 2 =4
	Elective Foundation	1T	1 x 2	1 x 2	1 x 10	1 x 40	1 x 50	1x1 =1
Group 4	CC & EC	1T	1 x 2	1 x 2	1 x 50	-	1 x 50	1x1=1
Total Semester Credits								17

Group 2: Elective Courses:

- i) Discipline Supportive ii). Expanded scope. ii.) Skill development iv) Another Discipline/Domain

V Semester

+	Particulars	No. of courses T/P	Instruction Hours/Week	Duration of Exam(hrs)	Marks			Credits
					IA	Exam	Total	
Group I	4 Commerce courses	4T	4x5	4x3	4x30	4x120	4x150	4x3
	Computer Application	1T	1 x 5	1 x 3	1 x 30	1 x 120	1x150	1x3
		1T	1 x 4	1 x 3	1 x 20	2 x 80	1x100	1x2
		1P	1 x 3	1 x 3	1 x 10	1 x 40	1x 50	1x1

VI Semester

Courses Group	Particulars	No. of courses T/P	Instruction Hours/Week	Duration of Exam(hrs)	Marks			Credits
					IA	Exam	Total	
Group I	4 Commerce courses	4T	4x5	4x3	4x30	4x120	4x150	4x3
	Computer Application (Vocational Course)	2 T	2 x 4	2 x 3	2 x 20	2 x 80	2x100	2x2
		1 Project	1 x 4	-	1 x 20	1 x 80	1x100	1x2

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I SEMESTER

Group	Course Code	Course	Instruction Hours/Week	Duration of exams (Hrs)	Marks & Credits			
					IA	Exam	Total	Credits
I	BCMCAC131	Information Technology	4	3	20	80	100	2
	BCMCAC132	Problem Solving with C	4	3	20	80	100	2
	BCMCAP133	Office Automation and C Lab	4	3	10	40	50	1
II	BCMCACE134 BCMCACE135	E1: Computer Network E2: Open Source Software	2	2	10	40	50	1
		Total	14	11	60	240	300	6

II SEMESTER

Group	Course Code	Course	Instruction Hours/Week	Duration of exams (Hrs)	Marks & Credits			
					IA	Exam	Total	Credits
I	BCMCAC181	Operating System	4	3	20	80	100	2
	BCMCAC182	Desktop Publishing	4	3	20	80	100	2
	BCMCAP183	OS and DTP Lab	4	3	10	40	50	1
II	BCMCACE184 BCMCACE185	E1: Data Mining with R E2: Business Statistics with R	2	2	10	40	50	1
		Total	14	11	60	240	300	6

III SEMESTER

Courses Group	Course Code	Course	Instruction Hours/Week	Duration of exams (Hrs)	Marks & Credits			
					IA	Exam	Total	Credits
I	BCMCAC231	Java Programming	4	3	20	80	100	2
	BCMCAC232	DBMS	4	3	20	80	100	2
	BCMCAP233	Java and DBMS Lab	4	3	10	40	50	1
II	BCMCACE234 BCMCACE235	E1: Python Programming E2: Multimedia Applications	2	2	10	40	50	1
		Total	14	11	60	240	300	6

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IV SEMESTER

Courses Group	Course Code	Course	Instruction Hours/Week	Duration of exams (Hrs)	Marks & Credits			
					IA	Exam	Total	Credits
I	BCMCAC281	Web Application development	4	3	20	80	100	2
	BCMCAC282	Computerized Accounting	4	3	20	80	100	2
	BCMCAP283	Web Application and Tally Lab	4	3	10	40	50	1
II	BCMCAOE284	E1: IT Fundamentals	2	2	10	40	50	1
	BCMCAOE285	E2: Internet Technologies						
Total			14	11	60	240	300	6

V SEMESTER

Courses Group	Course Code	Course	Instruction Hours/Week	Duration of exams (Hrs)	Marks & Credits			
					IA	Exam	Total	Credits
I	BCMCAC331	VB.NET Programming	05	03	30	120	150	3
	BCMCAC332	E1: Computer Graphics and Animation	04	03	20	80	100	2
	BCMCAC333	E2: Android Application						
	BCMCAC334	E3: Programming for Analytics						
	BCMCAP 335 BCMCAP 336 BCMCAP 337	E1: VB and Computer Graphics Lab / E2: VB and Android Application Lab / E3: VB and Programming for Analytics Lab	03	03	10	40	50	1
Total			12	09	60	240	300	6

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VI SEMESTER

Courses Group	Course Code	Course	Instruction Hours/Week	Duration of exams (Hrs)	Marks & Credits			
					IA	Exam	Total	Credits
I	BCMCAC381	Software Engineering	04	3	20	80	100	2
	BCMCAC382	E1: Software Testing	04	3	20	80	100	2
	BCMCAC383	E2: E-Commerce						
	BCMCAC384	E3: Information Security and Cyber Laws						
BCMCAC385	Project	04	-	20	80	100	2	
Total			12	06	60	240	300	6

Total Marks :1800

Total number of Credits: 36

Common Scheme of Practical Examinations for I semester to VI

The practical examination in the concerned subject specified in the I Semester to IV Semester shall be conducted for 40 marks. There shall be two main components: problem solving and viva-voce components. There shall be two main problems from the single domain/multiple domain subjects chosen for practical components. And Viva- Voce component shall have to access both the problem solving/Analytical thinking approach and the programming skills.

Sl.No.	Details	Allocated Marks for one Problem	2 Problems
I.	Problem Solving Components ----- 2 Problems * 15		
i.	Problem solving with Programs Detail Descriptions	05	10
ii.	Compiling Code and Debugging	05	10
iii.	Execution and Testing	05	10
iv.	Record	--	05
II.	Viva- Voce Examination----- 5 Marks		
ii	Viva - Voce (Question and Answer)	--	05
Total Marks			40

B.Com.-Computer Applications(Vocational Programme)

2019-2020

PREFACE

Preamble: Due to Globalization of education and economy, UGC has long back identified the necessity to align higher education with the emerging needs of the economy so as to make the current Indian Higher Education System more relevant and career-oriented with focus on quality and excellence and also to ensure that the graduates of higher education system have adequate knowledge and skills for employment and entrepreneurship. It is envisaged that professionally qualified graduates with a sound knowledge of their core disciplines and expertise in a concerned skill will have more openings in service, industry and self-employment sectors. Demand and scope for such professionally trained graduates are visible in the applied fields of almost all basic/core disciplines and faculties in the current changing global scenario and is likely to increase in the future. The higher education system has to incorporate the requirements of various industries in its curriculum, in an innovative and flexible manner while developing a holistic and well-groomed graduate. The scheme was designed to ensure that graduates who pass out after completing these courses would have knowledge, skills and aptitude for gainful employment in the wage sector in general and self-employment in particular.

The UGC initiated a major programme of Vocationalisation at undergraduate level during VIII Plan (1994-95). The scheme was designed to ensure that graduates who pass out after completing these courses would have knowledge, skills and aptitude for gainful employment in the wage sector in general and self-employment in particular. Vocationalisation of Bachelor of Commerce with the introduction of Computer Application as vocational course at the first-year degree was proposed during that time.

Programme Objectives(PO):

PO1: Impart advanced learning to students in the discipline of Commerce, specifically with the application of software technology for professional requirements, merging the academic domains of Commerce and Computer Applications

PO2: To impart central knowledge and skills to the students in emerging areas of commerce like accounting, auditing, finance, marketing, HR, company laws, taxation etc with computing skills for effective domain enrichment

PO3: To groom students with desired competence in commerce education and research with computing leverage.

PO4: To strengthen theoretical and applied aspects of commerce for preparing the students for higher education and research.

PO5: To equip the students with necessary skill sets pertaining to computing principles, software technologies and business practices in software solutions essential for gaining appropriate employment, becoming entrepreneurs and creating appropriate knowledge.

PO6: To impart demonstratable knowledge, skills and values in order to support students' eventual progression to higher learning and gainful career with resilient value system.

Programme Outcome(PO)

The Commerce graduates should be able to:

PO1: Apply the knowledge of commerce and computers to obtain constructive solutions to complex business & management problems.

PO2: Understand the concepts of key areas in computer science and apply latest technologies to solve problems in the areas of computer applications in business and commerce

PO3: Design solutions for Socio-economic, commerce and business problems and plan case study, processes to meet the specifications with consideration for sustainable development.

PO4: Use modern computing models and tools to conduct investigations of complex economic, business and management problems including analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Understand digital ethics - what can be made possible by digital technology and what is ethically desirable, in order to be successful leaders in the business world

PO6: Use digital edge in order to function effectively as an individual, and as a member or leader in teams, and in multidisciplinary settings, communicate effectively with the business community & IT professionals and with society at large.

PO7: Demonstrate knowledge and understanding of Commerce, Management & Software engineering principles and apply these to one's own work, as a member and leader in a team.

PO8: Recognize the need for and have the preparation and ability to engage in independent and life – long learning in the broadest context of technological change.

Programme Specific Outcome(PSO)

After completion of Bachelor of Commerce in Computer Applications (B.Com-CA) Programme students are able to:

PSO1: Gain foundation and incremental knowledge in different areas of Commerce.

PSO2: Develop basic understanding of conceptual and functional knowledge of software commonly used in academic and professional environments.

PSO3: Acquire the skills of applying principles and techniques of Computers and Software technologies in modelling solutions to problems in Commerce, Business and Management

PSO4: Develop right attitude for working effectively and efficiently in Commerce and business environment with computing edge.

PSO5: Work in teams with enhanced communication, inter-personal skills and be capable of making decisions at personal and professional level.

PSO6: Provide technical support and computing leverages for improved communication in Office and Business management.

PSO7: Position themselves as potential candidates for employment in functional areas like Accounting, Taxation, Banking, Insurance, Marketing, Corporate law, Entrepreneurship and Software Application and Development.

PSO8: Pursue their career in industry, teaching and research with an inclination towards lifelong learning and acquiring contemporary knowledge and skills

Prospects of Higher Education:

After completion of Bachelor of Commerce in Computer Applications (B.Com-CA) Programme students are able to pursue (indicative):

Master of Commerce (M.Com), Master of Commerce in Computer Applications (M.Com-CA), Master of Business Administration (MBA), Master of Business Administration (M.B.A-Tourism And Hospitality Management), Chartered Accountancy (CA), Business Accounting and Taxation (BAT), Certified Management Accountant(CMA), Master of Computer Applications (MCA), Master of International Business (MIB), Master of Finance and Accounting (MFA), Certified Public Accounting (CPA), Association of Chartered Certified Accountants (ACCA), Chartered Financial Analyst (CFA), Company Secretary (CS), Certified Industrial Accountant (CIA), Tally Financial Accounting Certification, Diploma in E-Commerce, Post graduate Diploma in Computer Applications (PGDCA), Cisco Certified Network Associate (CCNA), Mobile App Development, Web Programming/application development (PHP Frameworks, Ruby, and Python), User Interface (UI)/User Experience (UX) Development Frameworks (HTML, CSS, Bootstrap etc.), Project Management Professional Certification (PMP), Database administration (DBA), Software Quality Testing (SQT), Digital Marketing (Digital Technology Platforms), DevOps, Amazon Web Services (AWS), Advanced Java Frameworks etc.

Career Prospects:

After completion of Bachelor of Commerce in Computer Applications (B.Com-CA) Programme students are able to pursue the following careers (indicative):

Chartered Account/ Cost & Work Accountant, Company Secretary, Auditors, Tax Consultant, Economist, Budget Analysts, Government Jobs, Administrative Jobs, Human Resource Executive, Banker, Stock Broker, Lawyer, Teacher, Export Import Manager, Finance Consultant, Insurance Consultant, Event Manager, Travel Agent / Travel Manager, Book Keepers, Market Researcher, Entrepreneur, Hotel Management, Book Keepers, BPO / KPO Executive, Web Developer, Hardware Technician, Software Developer, Computer Programmer, Computer Operator, Mobile Application Developer, CAD Application Support Technician, Graphics Designer, Computer-Laboratory Technician etc.

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	BCMCAC132	Problem Solving with C	4	3	20	80	100	2
	BCMCAP133	Office Automation and C Lab	4	3	10	40	50	1
II	BCMCACE134 BCMCACE135	E1: Computer Network E2: Open Source Software	2	2	10	40	50	1
		Total	14	11	60	240	300	6

GROUP-I	BCMCAC131: Information Technology	48 hours	
COURSE-1			
Theory/Week: 4 Hrs			I.A: 20
Credits: 2			Exam: 80

Course Objectives:

- To make the students understand and learn the basics of computer for its effective use in day to day life.

Course Outcomes:

- Be able to apply knowledge of computing analyze a problem, and identify and define the computing requirements appropriate to its solution
- Be able to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs
- Be able to effectively integrate IT based solutions into the user environment

UNIT-I**12 Hrs.**

Introduction to Computers: Introduction, Characteristics computers, Evolution computers Generation of Computers, Classification of computers, the computer system, Application of computers. **Number system:** Introduction, Number system, Conversion between number bases, Arithmetic system, signed and unsigned numbers, concept of overflow, Binary coding. **Computer Architecture:** Introduction, Central processing unit, main memory unit, interconnection of units, cache, communication between various units of a computer system. **Primary memory:** Introduction, memory representation, memory hierarchy, Random access memory, Types of RAM, Read-only memory, Types of ROM.

UNIT-II**12 Hrs.**

Secondary Storage: Introduction, classification, magnetic tape, magnetic disk, Optical disk, Magneto-optical disk, Memory stick, Universal serial bus, Mass storage devices. **Input devices:** Introduction, Types of input devices, Optical character recognition, Optical Mark Recognition, Magnetic ink character recognition, Bar code reader, **Output devices:** Introduction, Types of output, Classification of output devices, Terminals.

UNIT-III**12 Hrs.**

Computer Program: Introduction, algorithm, flowchart. **Computer languages:** Introduction, Evolution of programming languages, classification of programming languages, generation of programming languages, Features of a good programming language, selection of a programming language. **Computer software:** Introduction, software definition, relationship between software and hardware, software categories, terminology software **Network basics:** Computer networks, Network topologies, Network devices.

UNIT-IV**12 Hrs.**

Internet basics: Introduction, Evolution, Basic internet terms, getting connected to internet, internet Applications, **Working with Application Software, Productivity software:** Word processing program, Spreadsheet program, presentation program, **Database and DBMS:** working with database, RDBMS

Text Books:

1. IITL Education Solutions Limited, **Introduction to Information Technology**, Pearson Education India; 2 edition, 2012.
2. Peter Norton, **Introduction to Computers**, 7th edition, Tata McGraw Hill Publication, 2017 (Unit - IV).

GROUP-I
COURSE-2

Theory/Week: 4 Hrs

Credits: 2

BCMCAC132: Problem Solving with C

48 hours

I.A: 20

Exam: 80

Course Objectives:

- To develop understanding about programming principles/concepts - functional, logic and also learn skills of problem solving and implementation of solution

Course outcomes:

- To apply programming knowledge to create solutions to challenging problems, including specifying, designing, implementing and validating solutions for new problems.

UNIT-I

12 Hrs.

Introduction: Overview of C Program, Importance of C-Program, Basic structure of a C-program, Execution Style of C-Program. **Constants, Variables & Data types:** Features of C language, Character set, C token, Keywords & identifiers, Constants, Variables, data types, Declaration of variables, assigning values to variables, defining symbolic constants. **Operators and Expression:** Arithmetic, Relational, logical, assignment, increment & decrement, conditional, bit wise & special operators, evaluation of expressions, Precedence of arithmetic operators, type conversions in expressions, operator precedence & Associativity, built in mathematical functions. **Managing Input and Output operations:** Reading & writing a character, Formatted input and output.

UNIT-II

12 Hrs.

Decision Making and Branching: Decision making with if statement, simple if statement, the if else statement, nesting of if ... else statements, the else if ladder, the switch statement, the ?: operator, the go to statement. **Decision making and looping:** The while statement, the do statement, for statement, exit, break, jumps in loops. **Arrays:** Declaration, initialization & access of one dimensional & two-dimensional arrays. Programs using one and two dimensional arrays. : Adding multiplying, transposing matrices, sorting and searching arrays.

UNIT-III

12 Hrs.

Handling of character strings: Declaring & initializing string variables, reading strings from terminal, writing strings to screen, Arithmetic operations on characters, putting strings together, comparison of two strings, string handling functions, table of strings. **User defined functions:** Need for user defined functions, Declaring, defining and calling C functions return values & their types, Categories of functions: With/without arguments, with/without return values, recursion, functions with arrays, the scope, visibility & lifetime of variables.

UNIT-IV

12 Hrs.

Structures and union: Structure definition, giving values to members, structure initialization, comparison of structure variables, arrays of structures, arrays within structures, structures within structures, structures & functions, unions, size of structures, bit fields. **Pointers:** Understanding pointers, accessing the address of a variable, declaring & initializing pointers, accessing a variable through its pointer, pointer expression, pointer increments & scale factor, pointers & arrays, Passing pointer variables as function arguments. **The Preprocessor:** Macro substitution, file inclusion, compiler control directives, command line arguments & illustrative programs. **File Management in C:** Introduction, defining and opening a file, closing a file, I/O operations on files, error handling during I/O operations.

Text Books:

1. E. Balagurusamy, **Programming in ANSI C**, McGraw Hill Education India Private Limited; Seventh edition, (2017)
2. .M. T. Somashekara, D. S. Guru, K. S. Manjunatha, **Problem Solving with C**, PHI Learning Pvt. Ltd.; Second edition, 2018

Reference Books:

1. Hanly, **Problem Solving and Program Design in C**, Pearson Education India; 7 edition, 2013
2. Satish Jain, **Programming & Problem Solving Through C Language**, BPB Publications, 2012

Practical-I	BCMCAP 133: OFFICE AUTOMATION and C LAB	48 Hours
Practical/Week: 4 Hrs Credits: 1	Exercises in MS-Office Package and C programming	I.A: 10 Exam: 40

**GROUP-II
COURSE-1****BCMCAE 134-E1: Computer Networks****24 hours****Theory/Week: 2 Hrs****I.A: 10****Credits: 1****Exam: 40****Course Objectives:**

- Introduce basics of data communications and network architecture, network layer control and protocols
- Be familiar with internetworking technologies and Web technologies

Course outcomes:

Acquire knowledge about

- basics, components of Network, Internet and Web technology;
- basics of Internet technology, such as http and the World Wide Web, HTML, and JavaScripts;
- WWW pages to serve as front-end to client/server, Internet applications;

UNIT-I**12 Hrs.**

Computer Networks: Introduction to computer network, data communication, components of data communication, data transmission mode, data communication measurement, LAN, MAN, WAN, wireless LAN, internet, intranet, extranet. Network Models: Client/ server network and Peer-to-peer network, OSI, TCP/IP, layers and functionalities. **Transmission Media:** Introduction, Guided Media: Twisted pair, Coaxial cable, Optical fiber. Unguided media: Microwave, Radio frequency propagation, Satellite.

LAN Topologies: Ring, bus, star, mesh and tree topologies.

UNIT-II**12 Hrs.**

Network Devices: NIC, repeaters, hub, bridge, switch, gateway and router. Internet Terms: Web page, Home page, website, internet browsers, URL, Hypertext, ISP, Web server, download and upload, online and offline. Internet Applications: www, telnet, ftp, e-mail, social networks, search engines, Video Conferencing, E-Commerce, M-Commerce, VOIP, blogs. **Introduction to Web Design:** Introduction to hypertext markup language (html) Document type definition, creating web pages, lists, hyperlinks, tables, web forms, inserting images, frames, hosting options and domain name registration. Customized Features: Cascading style sheet (CSS) for text formatting and other manipulations. JavaScript Fundamentals: Data types and variables, functions, methods and events, controlling program flow, JavaScript object model, built-in objects and operators.

Text Books:

1. Andrew S. Tanenbaum, David J. Wetherall, **Computer Networks**, PHI, 2011
2. D.R. Brooks, **An Introduction to HTML and Javascript for Scientists and Engineers**, Springer , 2011

Reference Books:

1. A. Forouzan, **Data Communication and Networking**, TMH, 2017
2. **HTML A Beginner's Guide**, Tata McGraw-Hill Education, 2009
3. J. A. Ramalho, **Learn Advanced HTML 4.0 with DHTML**, BPB Publications, 2017

**GROUP-II
COURSE-2****BCMCACE 135-E2: Open Source Software****24 hours****Theory/Week: 2 Hrs****I.A: 10****Credits: 1****Exam: 40****Course Objectives:**

Help students

- Understand concepts, strategies, and methodologies related to open source software development.
- Understand the business, economy, societal and intellectual property issues of open source software.

Course outcomes:

Upon successful completion of the course the student will be able to:

- Be familiar with open source software products and development tools currently available on the market.
- Be able to utilize open source software for developing a variety of software applications, particularly Web applications.

UNIT-I**12 Hrs.**

The philosophy of OSS, commercial software vs OSS, free software vs freeware. The Linux operating system, GPL, LGPL and other licenses. Category of OSS Application Software, Study of Commercial Application software vs OSS, Open Office, GAMBAS, GIMP etc.

UNIT-II**12 Hrs.**

Software Development Using Open Source and Free Software Licenses: Introduction, Models of Open Source and Free Software Development, Forking, Choosing an Open Source or Free Software License, Drafting Open Source Licenses

Text Books:

1. Andrew St. Laurent, **Understanding Open Source and Free Software Licensing** – O'Reilly Media, 2004

Reference Books:

1. P. Rizwan Ahmed, **Open Source software**, Margham Publications, 2015
2. Ashish Gavande, **Understanding Free and Open Source**, 2017

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II SEMESTER

Group	Course Code	Course	Instruction Hours/Week	Duration of exams (Hrs)	Marks & Credits			
					IA	Exam	Total	Credits
I	BCMCAC181	Operating System	4	3	20	80	100	2
	BCMCAC182	Desktop Publishing	4	3	20	80	100	2
	BCMCAP183	OS and DTP Lab	4	3	10	40	50	1
II	BCMCACE184	E1: Data Mining with R	2	2	10	40	50	1
	BCMCACE185	E2: Business Statistics with R						
		Total	14	11	60	240	300	6

GROUP-I	BCMCAC181: Operating System	48 hours
COURSE-3		I.A: 20
Theory/Week: 4 Hrs		Exam: 80
Credits: 2		

Course Objectives:

- To make students understand the purpose, role, structure, functions, application of operating systems
- Understand services provided by operating systems

Course Outcomes:

- Analyze the structure of OS and basic architectural components involved in design
- Analyze the various resource management techniques
- Interpret the mechanisms adopted for file sharing
- conceptualize the components involved in designing a contemporary OS
- To be familiar with various types of operating systems

UNIT-I 12 Hrs.

Introduction: Operating system, Mainframe systems, Desktop Systems, Multi-processor Systems, Distributed Systems, Cluster systems, Real Time Systems, Handheld Systems, Future Migration, Computing Environment. **Operating System Structures:** System Components, Operating System Services, System Calls, System structures. **Process Management:** Process concept, Process Scheduling, Operations on process, Cooperative Process, Inter process Communication. **Threads:** Overview, Multithreading Models.

UNIT-II 12 Hrs.

CPU Scheduling: Basic concepts, Scheduling criteria, Scheduling algorithms, multiple processor scheduling. **Process Synchronization:** Background, the critical section Problems, Synchronization, Semaphore, Classic problems synchronization hardware, Critical region Monitor, Semaphore. **Deadlocks:** System model, deadlock characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection.

UNIT-III 12 Hrs.

Memory Management: Background, Swapping, contiguous Memory allocations, Paging, segmentation, segmentation with paging, **Virtual Memory:** Background, demand paging, process creation, page replacement, allocation of frames and thrashing. **File Management:** File concept, Access methods, Directory structure, File system Mounting, File sharing, Protection.

UNIT-IV 12 Hrs.

Linux: An introduction, reason for its popularity, Linux file system, login and logout. **Linux commands:** Command format, Directory oriented command, wild card characters, File oriented commands, File Access Permissions, Process oriented commands, Background processing, Communication oriented commands, General purpose commands, Pipe and Filters related commands, vi editor, Shell programming, System administration.

Text Books:

1. Silberschartz, Galvin and Gagne, **Operating Systems Concepts**, 8th Edition, John Wiley & sons, Pvt. Ltd.2008
2. B Mohamed Ibrahim, **Linux: A Practical Approach**, Laxmi Publications; First edition, ,2016
- 3.

Reference Books:

1. Pramod Chandra P. Bhatt, **An Introduction to Operating Systems: Concepts and Practice (GNU/ Linux)**, Prentice Hall India Learning Private Limited; Fourth edition, 2013
2. Richard Blum, Christine Bresnahan, **Linux Command Line and Shell Scripting Bible**, Third edition, Wiley, 2015.
3. Sobell, **Practical Guide to Linux Commands Editor**, Pearson Education India; 3 edition, 2013.

GROUP-I	BCMCAC 182: Desktop Publishing	48 hours
COURSE-4		
Theory/Week: 4 Hrs		I.A: 20
Credits: 2		Exam: 80

Course Objectives:

- Use strategies to obtain and evaluate print and digital information from a variety of electronic resources and in a variety of electronic formats.
- Identify the tasks and use appropriate software and documentation to create specific projects in desktop publishing
- Create and present publication project using and describing the principles and skills necessary for its creation.
- Evaluate projects according to criteria defined in technology application standards for desktop publishing

Course Outcomes:

- Gain basic understanding of the field of desktop publishing
- Acquire skills of preparing projects for publication which include layout and design
- Learn both the technical and aesthetic aspects of text, image manipulation and integration
- Learn using design as a means of communication, along with using tools to implement effective design strategies

UNIT-I**12 Hrs.**

Introduction to InDesign: Introduction to the Workspace • Getting to Know InDesign • Setting Up a Document and Working with Pages • Working with Objects • Flowing Text • Editing Text • Working with Typography • Working with Color • Working with Styles • Importing and Modifying Graphics • Creating Tables • Working with Transparency • Printing and Exporting • Creating Adobe PDF Documents with Form Fields • Exporting for E-Readers • Working with Long Document.

UNIT-II**12 Hrs.**

Introduction to CorelDraw: • Getting started with Corel Draw Introduction to Corel Draw Features of Corel Draw Corel Draw Interface Tool Box Moving from Adobe Illustrator to Corel Draw Common Tasks • Drawing and Coloring Introduction Selecting Objects Creating Basic Shapes Reshaping Objects Organising objects Applying color fills and Outlines • Mastering with Text Introduction Text Tool Artistic and paragraph text Formatting Text Embedding Objects into text Wrapping Text around Object Linking Text to Objects • Applying Effects Introduction Power of Blends Distortion Contour Effects Envelopes Lens effects Transparency Creating Depth Effects Power Clips • Working with Bitmap Commands Introduction Working with Bitmaps.

UNIT-III**12 Hrs.**

Introduction to Photoshop: Zoom and navigate through a photo. Crop, straighten horizon lines and rotate., Adjust the image for levels and color. Change modes from RGB to grayscale and create duotones, Dodge and burn specific areas of a photo, Use selection tools to further adjust and enhance the image, Use the clone tool to repair and manipulate the image, Use filters to change the image in artistic and unreal ways.

UNIT-IV**12 Hrs.**

Getting Started with Flash Professional CS6, Working with Graphics, Working with Symbols and Instances, Timelines and Animation, Creating Interactive Navigation, working with Text.

Text Books:

1. Ramesh Bangia, **Learning Desk Top Publishing (DTP)**, Khanna Book Publishing Co. (P) Ltd.; 1 edition, 2016.
2. Satish Jain, **BPB DTP Course**, BPB, 2014
3. Satish Jain, **Adobe Flash Professional CS6 Training Guide** Paperback, First edition, BPB Publications, 2016

Reference Books:

1. Kogent Learning Solutions Inc., **InDesign CS6 in Simple Steps**, Dreamtech Press, 2012
2. Kogent Learning Solutions Inc., **Photoshop CS6 in Simple Steps**, Dreamtech Press, 2012 Kogent Learning Solutions Inc., "Flash CS6 in Simple Steps", First Edition, Dreamtech Press, 2013.
3. Kogent Learning Solutions Inc., **CorelDRAW X7 in Simple Steps**, Dreamtech Press, 2014.

Practical-II	BCMCAP 183: Linux Lab	48 Hours
Practical/Week:42 Hrs Credits: 1	Lab Exercises in Linux and DTP Packages	I.A: 10 Exam: 40

GROUP-II	BCMCACE 184-E1: Data Mining with R	24 hours
COURSE-3		
Theory/Week: 2		I.A: 10
Hrs, Credits: 1		Exam: 40

Course Objectives:

Help students

- Learn the basic concepts of R: the data frame and data manipulation
- Discover powerful tools for data preparation and data cleansing
- Visually find patterns in data
- Work with complex data sets and understand how to process data sets
- Get to know how object-oriented programming is done in R
- Explore graphs and the statistical measure in graphs

Course outcomes:

Upon successful completion of the course the student will gain:

- Ability to identify the characteristics of datasets
- Ability to select and implement data mining techniques in R suitable for the applications under consideration.
- Ability to recognize and implement various ways of selecting suitable model parameter for different machine learning techniques.

UNIT-I**12 Hrs.**

Introduction to Data Mining and R: A brief introduction to Data Mining, Main tasks and objectives, Illustrative case studies, A brief introduction to R and Rstudio, Basic concepts of the R language.

Data Munging: Presentation of the first case study, Importing data into R, Data summarization, Examples and exercises in R. Data Visualization and Reporting: Data visualization, Examples and exercises in R, Reporting, Dynamic reports and presentations in R using knitr

UNIT-II**12 Hrs.**

Predictive Analytics: Introduction to predictive modelling, Classification and regression tasks, Evaluation metrics, Linear discriminants and linear regression, classification and regression trees, Support vector machines, Ensembles and Random forests, Model evaluation strategies, Reliability of estimates

Model Evaluation and Selection: Experimental methods for performance estimation, Cross validation, Holdout, Bootstrap, The performance Estimation package, Illustrations in R, Statistical significance of the observed differences, Illustrative case studies and hands on practice

Text Books:

1. G. K. Gupta, **Introduction to Data Mining with Case Studies**, 3rd Edition, PHI Yanchang Zhao, 2016
2. Yonghua Cen, **Data Mining Applications with R**, 1st Edition, Academic Press, 2013
3. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, **Introduction to Data Mining**, Pearson, 2013

Reference Books:

1. M Ramakrishna Murthy, **Introduction to Data Mining and Soft Computing Techniques**, Laxmi Publications Pvt Ltd, 2017.
2. Paul Teetor, **R Cookbook: Proven Recipes for Data Analysis, Statistics, and Graphics**, O'reilly Cookbooks, 2011
3. Garrett Grolemond, Hadley Wickham, **Hands-On Programming with R: Write Your Own Functions and Simulations**, 1st Edition, O'reilly , 2014

GROUP-II	BCMCACE 185-E2: Business Statistics with R	24 hours
COURSE-4		
Theory/Week: 2 Hrs		I.A: 10
Credits: 1		Exam: 40

Course Objectives:

Help students

- Learn the basic concepts of R: the data frame and data manipulation
- Discover powerful tools for data preparation and data cleansing
- Visually find patterns in data
- Work with complex data sets and understand how to process data sets
- Get to know how object-oriented programming is done in R
- Explore graphs and the statistical measure in graphs

Course outcomes:

Upon successful completion of the course student will be able to:

- Gain motivation for exploring R for statistical applications
- Access online resources for R and import new function packages
- Import, review, manipulate and summarize data-sets in R

UNIT-I**12 Hrs.**

Introduction, how to run R, R Sessions and Functions, Basic Math, Variables, Data Types, Vectors, Conclusion, Advanced Data Structures, Data Frames, Lists, Matrices, Arrays, Classes. R Programming Structures, Control Statements, Loops, – Looping Over Nonvector Sets,- If-Else, Arithmetic and Boolean Operators and values, Default Values for Argument, Return Values, Deciding Whether to explicitly call return- Returning Complex Objects, Functions are Objective, No Pointers in R, Recursion

Doing Math and Simulation in R, Math Function, Extended Example Calculating Probability-Cumulative Sums and Products-Minima and Maxima- Calculus, Functions Fir Statistical Distribution, Sorting, Linear Algebra Operation on Vectors and Matrices, Extended Example: Vector cross Product- Extended Example: Finding Stationary Distribution of Markov Chains, Set Operation, Input /output, Accessing the Keyboard and Monitor, Reading and writer Files

UNIT-II**12 Hrs**

Graphics, Creating Graphs, The Workhorse of R Base Graphics, the plot() Function – Customizing Graphs, Saving Graphs to Files. Probability Distributions, Normal Distribution- Binomial Distribution- Poisson Distributions Other Distribution, Basic Statistics, Correlation and Covariance, T-Tests,-ANOVA.

Linear Models, Simple Linear Regression, -Multiple Regression Generalized Linear Models, Logistic Regression, – Poisson Regression- other Generalized Linear Models-Survival Analysis, Nonlinear Models, Splines- Decision- Random Forests,

Text Books:

1. A K Verma, **The Art of R Programming**, Cengage Learning
2. Lander, R for Everyone, Addison-Wesley Professional. , 2017
3. Mark van der Loo, Edwin de Jonge, **Learning RStudio for R Statistical Computing**, Packt Publishing Limited, 2012

Reference Books:

1. Paul Teetor, **R Cookbook: Proven Recipes for Data Analysis, Statistics, and Graphics**, O'reilly Cookbooks, 2011
2. Garrett Golemud, Hadley Wickham, **Hands-On Programming with R: Write Your Own Functions and Simulations**, 1st Edition, O'reilly , 2014

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III SEMESTER

Courses Group	Course Code	Course	Instruction Hours/Week	Duration of exams (Hrs)	Marks & Credits			
					IA	Exam	Total	Credits
I	BCMCAC231	Java Programming	4	3	20	80	100	2
	BCMCAC232	DBMS	4	3	20	80	100	2
	BCMCAP233	Java and DBMS Lab	4	3	10	40	50	1
II	BCMCACE234	E1: Python Programming	2	2	10	40	50	1
	BCMCACE235	E2: Multimedia Applications						
Total			14	11	60	240	300	6

GROUP-I	BCMCAC 231: Java Programming	48 hours
COURSE-5		
Theory/Week: 4 Hrs		I.A: 20
Credits: 2		Exam: 80

Course Objectives:

- To introduce basic Java language syntax and semantics to write programs in JAVA.
- To enable understand the fundamentals of object-oriented programming in Java
- Create, Debug and test a software application using the Java programming language.

Course Outcomes:

On successful completion of this course the student should be able to:

- Create Java programs that solve simple business problems.
- Validate user input, Perform a test plan to validate a Java program and Document a Java program.

UNIT-I**12 Hrs.**

Java Evolution: Java history, Java features, How Java differs from C and C++, Hardware and Software requirements, Java support systems, Java environment. **Overview of Java Language:** Introduction, Simple Java Program, More of Java, An application with two classes, Java program structure, Java Tokens, Java Statements, Implementing a Java Program, Java Virtual Machine, Command line arguments. **Constants, Variables and Data Types:** Introduction, Constants, variables, data types, Declaration of variables, giving values to variables, Scope of variables, Standard default values. **Operators:** Introduction, Arithmetic, Relational, Logical, Assignment, Increment & decrement, conditional, Bitwise operators, special operators: **Expressions:** Arithmetic expressions, Evaluation of expressions, Precedence of arithmetic operators, Type conversions in expressions, operator precedence and associativity, **Mathematical functions.**

UNIT-II**12 Hrs.**

Decision making and branching: Introduction, Decision making with If statements, simple IF statement, Nesting of IFELSE statements. ELSE.....if.....ladder, the switch statement, the ?: operator **Decision making and Looping:** Introduction, The while statement, THE Do statement, the For statement, Jumps in Loops, Labeled Loops. **Classes objects and methods:** Introduction, Defining a Class, Adding Variables Adding methods, Creating Objects, Accessing Class members, Constructors, Methods Overloading, Static Members, Nesting of Methods, Inheritance, Overriding Methods, Final variables and Methods, Final classes, Finalizer Methods, Abstract Methods and Classes, Visibility Control. Arrays, Strings and Vectors. **Arrays:** One - Dimensional Arrays, Creating an Array, Two Dimensional Arrays, Strings, Vectors, Wrapper Classes.

UNIT-III**12 Hrs.**

Interfaces: Multiple Inheritance: Introduction, Defining Interfaces, Extending Interfaces, Implementing Interfaces, Accessing Interface Variables. **Packages:** putting classes together: Introduction, Java, API Packages, Using System Packages, Naming Conventions, Creating Packages, accessing a Package, using a Package, adding a class to a Package, Hiding classes.

UNIT-IV**12 Hrs.**

Multithreaded Programming: Introduction, Creating Threads, Extending the Thread Class, Stopping and Blocking a Thread, Life Cycle of a Thread, Using Thread Methods, Thread Exceptions, Thread Priority, Synchronization, Implementing the 'Runnable' Interface. **Managing Errors and Exceptions:** Introduction, Types of Errors, Exceptions, Syntax of Exception Handling Code, Multiple Catch Statements, Using Finally Statement, throwing our own Exceptions, Using Exceptions for Debugging

Text Books:

1. E Balaguruswamy, **Programming with Java A primer**, 5th edition, Tata McGraw Hill Publishing Company Limited,2017.

Reference Books:

1. Yashavant Kanetkar, **Let us JAVA**, 3rd Edition, BPB, 2017.
2. Herbert Schildt, **The Complete Reference Java**, Ninth edition, McGraw Hill Education, 2017.

GROUP-I	BCMCAC 232: DBMS Concepts	48 hours
COURSE-6		I.A: 20
Theory/Week: 4 Hrs		Exam: 80
Credits: 2		

Course Objectives:

- Learn and practice data modelling using the entity-relationship and developing database designs.
- Understand the use of Structured Query Language (SQL) and learn SQL syntax.
- Apply normalization techniques to normalize the database
- Understand the needs of database processing and learn techniques of developing program interfaces to a database

Course Outcomes:

The student will be able:

- To describe data models and schemas in DBMS
- To understand the features of database management systems and Relational database.
- To Demonstrate an understanding of the relational data model and use SQL.
- To understand the functional dependencies and design of the database and use SQL solutions to a broad range of query and data update problems.

UNIT-I**12 Hrs.**

Database Systems: Database System Concepts and Architecture, Database Systems versus File Systems. Data Abstraction, Data independence, Schemas and Instances, Data models, Database Languages, Database Users, DBA. Structure of Database Systems. **Data Modelling:** E-R model, Entity types, sets, Attributes, Keys, Relationships, Relationship Types, Roles, and Structural Constraints, Weak Entity sets, E-R Diagrams. Different types of database models and their advantages and disadvantages.

UNIT-II**12 Hrs.**

Basic structure of Oracle System: Database Structure and its manipulation in Oracle, Storage organization in Oracle Creation of Database: Creating, changing and dropping the tables. Integrity Constraints specification, maintaining reference integrity constraints, Data insertion, Deletion and modification. Querying the database: Information retrieval using SELECT statement, various features of SELECT statement, Aggregate functions, ORDER BY clause, working with expressions and sub queries handling of multiple tables. Views: Creation of views.

UNIT-III**12 Hrs.**

PL/SQL Basics: Introduction, character set, reserve words, Block structure, Data types, Conditional statements, looping statements, procedures, functions.

UNIT-IV**12 Hrs.**

Cursors: Implicit and explicit cursors, cursor attributes, triggers, packages. Exceptions SQL PLUS concepts: Reports and form design issues.

Text Books:

1. Silberschatz and Korth, **Database System Concepts**, 6th Edition, McGraw Hill Publication, 2010
2. Elmasri and Navathe, **Fundamentals of Database Systems**, 7th edition, Pearson Education Asia Publication, 2016
3. Ivan Bay Ross, **SQL, PL/SQL the Programming Language of Oracle**, 4th Edition, BPB Publications, 2009

Reference Books:

1. P.S. Deshpande, **SQL & PL/SQL for Oracle 11g**, Black Book Dreamtech Press, 2011.
2. Michael McLaughlin, **Oracle Database 11g PL/SQL Programming**, McGraw Hill Education; 1 edition, 2017.

Practical-III	BCMCAP 233: Java and DBMS Lab	48 hours
Practical/Week: 4 Hrs Credits: 2	Exercises in Java Language and DBMS	I.A: 10 Exam: 40

**GROUP-II
COURSE-5**

BCMCACE 234-E1: Python Programming

24 hours

Theory/Week: 2 Hrs

I.A: 10

Credits: 1

Exam: 40

Course Objectives:

- introduce programming using the Python programming language with emphasis common algorithms and programming principles utilizing standard library distributed with Python.

Course outcomes:

- Be skilled at creating, debugging and testing a software application using the Python programming language.
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UNIT-I

12 Hrs.

Planning the Computer Program: Concept of problem solving, Problem definition, Program design, Debugging, Types of errors in programming, Documentation. Techniques of Problem Solving: Flowcharting, decision table, algorithms, Structured programming concepts, Programming methodologies viz. top-down and bottom-up programming. Overview of Programming: Structure of a Python Program, Elements of Python Introduction to Python: Python Interpreter, Using Python as calculator, Python shell, Indentation. Atoms, Identifiers and keywords, Literals, Strings, Operators (Arithmetic operator, Relational operator, Logical or Boolean operator, Assignment, Operator, Ternary operator, Bit wise operator, Increment or Decrement operator). Creating Python Programs: Input and Output Statements, Control statements (Branching, Looping, Conditional Statement, Exit function, Difference between break, continue and pass.), Defining Functions, default arguments, Errors and Exceptions

UNIT-II

12 Hrs.

Iteration and Recursion: Conditional execution, Alternative execution, Nested conditionals, The return statement, Recursion, Stack diagrams for recursive functions, Multiple assignment, The while statement, Tables, Two-dimensional tables. Strings and Lists: String as a compound data type, Length, Traversal and the for loop, String slices, String comparison, A find function, Looping and counting, List values, Accessing elements, List length, List membership, Lists and for loops, List operations, List deletion. Cloning lists, Nested lists. Object Oriented Programming: Introduction to Classes, Objects and Methods, Standard Libraries. Data Structures: Arrays, list, set, stacks and queues. Searching and Sorting: Linear and Binary Search, Bubble, Selection and Insertion sorting.

Text Books:

1. Ch Satynarayana, M Radhika Mani, ands B N Jagadeesh, Python Programming, Universities Press, 2018.
1. Timothy A Budd, **Exploring Python**, TMH, 2009
2. Allen Downey, Jeffrey Elkner, Chris Meyers, **How to think like a computer scientist: learning with Python**, 1st Edition – Freely available online, 2015

Reference Books:

1. Yuxi (Hayden) Liu, **Python Machine Learning by Example**, Packt Publishing Limited, 2017
2. Narasimha Karumanchi, **Data Structures and Algorithmic Thinking with Python: Data Structure and Algorithmic Puzzles**, Career Monk Publications, 2015

**GROUP-II
COURSE-6**

BCMFACE 235-E2: Multimedia and Applications

24 hours

Theory/Week: 2 Hrs

I.A: 10

Credits: 1

Exam: 40

Course Objectives:

- introduce basic knowledge and skills needed for development of multimedia systems and applications using available hardware and software tools.

Course outcomes:

- Apply acquired knowledge in the field of multimedia in practice and independently continue to expand knowledge in this field.
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UNIT-I

12 Hrs.

Multimedia: Introduction to multimedia, components, uses of multimedia, multimedia applications, virtual reality. Text: Fonts & Faces, Using Text in Multimedia, Font Editing & Design Tools, Hypermedia & Hypertext. Images: Still Images – bitmaps, vector drawing, 3D drawing & rendering, natural light & colors, computerized colors, color palettes, image file formats. Sound: Digital Audio, MIDI Audio, MIDI vs Digital Audio, Audio File Formats.

UNIT-II

12 Hrs.

Video: How video works, analog video, digital video, video file formats, video shooting and editing. Animation: Principle of animations, animation techniques, animation file formats. Internet and Multimedia: www and HTML, multimedia on the web – web servers, web browsers, web page makers and site builders. Making Multimedia: Stages of a multimedia project, Requirements to make good multimedia, Multimedia Hardware - Macintosh and Windows production Platforms, Hardware peripherals - Connections, Memory and storage devices, Multimedia software and Authoring tools

Text Books:

1. Tay Vaughan, **Multimedia: Making it work**, TMH, Eighth edition, 2006
2. Ralf Steinmetz and Klara Naharstedt, **Multimedia: Computing, Communications Applications**, Pearson, 2012

Reference Books:

1. Keyes, **Multimedia Handbook**, TMH, 1997
2. K. Andleigh and K. Thakkar, **Multimedia System Design**, PHI, 1996

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IV SEMESTER

Courses Group	Course Code	Course	Instruction Hours/ Week	Duration of exams (Hrs)	Marks & Credits			
					IA	Exam	Total	Credits
I	BCMCAC281	Web Application development	4	3	20	80	100	2
	BCMCAC282	Computerized Accounting	4	3	20	80	100	2
	BCMCAP283	Web Application and Tally Lab	4	3	10	40	50	1
II	BCMCAOE284 BCMCAOE285	E1: IT Fundamentals E2: Internet Technologies	2	2	10	40	50	1
		Total	14	11	60	240	300	6

GROUP-I	BCMCAC281: Web Application Development	48 hours
COURSE-7		
Theory/Week: 4 Hrs		I.A: 20
Credits: 2		Exam: 80

Course Objectives:

- To provide in-depth understanding of the tools and technologies necessary for Web application design and development.
- To make the students understand client side scripting like HTML, JavaScript and server side scripting like servlets, ASPs and database interfacing.

Course Outcomes:

- Have a sound knowledge of Web Application Terminologies, Internet Tools and web services.
- Select and apply markup languages for processing, identifying, and presenting information in web pages.
- Use scripting languages and web services to add interactive components to web pages.
- Design and implement websites with good aesthetic sense of designing
- Design to be reusable the software components in a variety of different environments.

UNIT-I 12 Hrs.

Internet Basics, Introduction to HTML - List - Creating Table - Linking document Frames - Graphics to HTML Doc - Style sheet - Style sheet basic - Add style to document - Creating Style sheet rules - Style sheet properties - Font - Text - List - Color and background color - Box - Display properties.

UNIT-II 12 Hrs.

Introduction to JavaScript - Advantage of JavaScript - JavaScript Syntax – Data type - Variable - Array - Operator and Expression - Looping Constructor - Function - Dialog box.

UNIT-III 12 Hrs.

JavaScript document object model - Introduction - Object in HTML - Event Handling - Window Object - Document object - Browser Object - Form Object - Navigator object Screen object - Build in Object – User defined object - Cookies

UNIT-IV 12 Hrs.

ASP. NET Language Structure - Page Structure - Page event, Properties & Compiler Directives. HTML server controls - Anchor, Tables, Forms and Files. Basic Web server Controls- Label, Textbox, Button, Image, Links, Check & Radio button, Hyperlink. Data List Web Server Controls - Check box list, Radio button list, Drop down list, List box, Data grid, Repeater.

Text Books:

1. Laura Lemay, Rafe Colburn, Jennifer Kyrnin, **Mastering HTML, CSS & Javascript Web Publishing**, BPB Publications; First edition,2016.

Reference Books:

1. Kogent Learning Solutions Inc., **Web Technologies: HTML, JAVASCRIPT, PHP, JAVA, JSP, ASP.NET, XML and Ajax, Black Book**, Dreamtech Press, 2009.
2. DT Editorial Services, **HTML 5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, jQuery)**, 2 Edition, Dreamtech Press, 2016
3. Dani Akash, **JavaScript by Example**, Packt Publishing Limited, 2017.
4. Satish Jain, **Web Designing and Development: Training Guide**, BPB Publication; First edition, 2015.
5. Hirdesh Bhardwaj, **Web Designing**, Pothi.com; 1 edition, 2016.

GROUP-I	BCMCAC 282: Computerized Accounting	48 hours
COURSE-8		I.A: 20
Theory/Week: 4 Hrs		Exam: 80
Credits: 2		

Course Objectives:

Help students to acquire

- understanding of basic concepts of accounting in respect of revenue, expense, assets, liability and equity
- competency to enter accounting transactions in the accounting software and generate different accounting reports/documents.
- Abilities to make cost analysis reports, profit & loss accounts, balance sheets, and cash flow statements etc.
- skills in maintaining accounting records, provides in-depth exposure to accounts receivable/ accounts payable, payroll and inventory modules.

Course Outcomes:

- Apply skills in Computerized Accounting for maintaining accounting records, making management decisions, and processing common business applications with primary emphasis on a general ledger package

UNIT-I**12 Hrs.**

COMPUTERIZED ACCOUNTING: Introduction–Importance–Application –Advantages and disadvantages – Difference between Manual Accounting and Computerized Accounting – Features of Accounting packages – Creation of Company–Groups–Ledgers, Pre-defined vouchers - Displaying - Altering – Deleting of vouchers, ledger and company.- Reports: Account Books – Registers - Statement of Accounts - Bank Reconciliation Statement - Day Book – Cash and Bank Books-Final Accounts of Sole Traders: Trail Balance - Profit and Loss Account - Balance Sheet.

UNIT-II**12 Hrs.**

ACCOUNTS WITH INVENTORY: Creation of Company with inventory and stock – Creation of Groups - Stock categories - Stock items – Godowns - Units of Measure - Inventory Vouchers - Pure Inventory Vouchers - Creating purchase order & Sales order – Invoicing - Display of inventory reports & statements. FINAL ACCOUNTS OF BUSINESS ORGANISATIONS: Preparation of Final Accounts for Nonprofit Organizations-Partnership firms - Corporate companies - Bank Accounts.

UNIT-III**12 Hrs.**

COST AND MANAGEMENT ACCOUNTING: Preparation of Stores Ledgers – Job costing - Common size statement - Funds Flow Statement - Cash Flow Statement - Ratio Analysis

UNIT-IV**12 Hrs.**

TAX ACCOUNTING: GOODS AND SERVICE TAX (GST), Create Company and Activate GST in Company Level, Creating Master and Set GST Rates, Creating Tax Ledgers, Transferring Tax Credits of VAT Excise and Service Tax to GST, Recording GST Sales and Printing Invoices, Recording GST Interstate Sales and Printing Invoices, Recording an Advance to Supplier under GST, Recording GST Local Purchase, Recording GST Interstate

Text Books:

1. SIA Experts, **Computerised Accounting**, SIA Publishers & Distributors Pvt Ltd, 2018
2. Yadagiri M., Srinivas G., **Computerized Accounting**, Jain Book Agency, 1st edition, 2008
3. Francis Princy, **Computerized Accounting Tally-9**, Kalyani Publications, 2014
4. Tally Education Pvt Ltd, **GST Using Tally.ERP 9 Release 6.1**, Sahaj Enterprises; 1 Edition, 2017.

Reference Books:

1. Parag Joshi, **Tally.ERP 9 with GST with Solved Problems**, Dnyansankool Prakashan; 1st edition, 2017.
2. Asok K. Nadhan, **Tally ERP 9 Training Guide**, BPB Publications; Fourth edition, 2018.
3. Rajesh Chheda, **Learn Tally.ERP 9 with GST and E-Way Bill**, Ane Books; 3 edition, 2018.
4. Yogesh Patel, **Free Accounting with Free Software**, Skylark Publications (UK); First edition, 2011

Practical-IV	BCMCAP 283: Web Application and Tally ERP Lab	48 hours
Practical/Week: 4 Hrs	Exercises on Web Applications and Tally package	I.A: 10
Credits: 1		Exam: 40

**GROUP-II
COURSE-7**

BCMCAOE 284-E1: IT Fundamentals

24 hours

Theory/Week: 2 Hrs

I.A: 10

Credits: 1

Exam: 40

Course Objectives:

- To make the students understand and learn the basics of computer for its effective use in day to day life.

Course outcomes:

- Be able to apply knowledge of computing analyze a problem, and identify and define the computing requirements appropriate to its solution
 - Be able to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs
 - Be able to effectively integrate IT based solutions into the user environment
-

UNIT-I

12 Hrs.

Introduction: Introduction to logical organization of computer, input and output devices (with connections and practical demo), keyboard, mouse, joystick, scanner, OCR, OMR, monitor, printer, plotter, primary memory, secondary memory, auxiliary memory. User Interface: Operating system as user interface, system tools, utility programs Database: Introduction to database, relational data model, Entity types, entity set, attribute and key, relationships, relation types, SQL queries: select, from, where, order

UNIT-II

12 Hrs.

Networks: Definition of network, classification of network, LAN, MAN, WAN, distinction among the networks, Guided Media: Twisted pair, Coaxial cable, and Optical fiber. Unguided media: Microwave, Radio frequency propagation, Satellite, LAN Topologies: Ring, bus, star, mesh and tree topologies. Internet Applications: Internet as a global network, Search Engine, Online education, Internet utilities – email, online banking, reservations etc. Use of Computers in Education and Research: Data analysis, Heterogeneous storage, e-Library, Google Scholar, Domain specific packages such as SPSS, SciLab, Mathematica etc.

Text Books:

1. ITL Education Solutions Limited, **Introduction to Information Technology**, Pearson Education India; 2 edition,2012.
2. Peter Norton, **Introduction to Computers**, 7th edition, Tata McGraw Hill Publication, 2017

Reference Books:

1. Anitha Goel, **Computer Fundamentals**, Pearson Education, 2010
2. Sanjay Saxena, A First Course in Computers 2003 Edition, 3rd Edition, Vikas Publishing House Pvt Limited, 2009

**GROUP-II
COURSE-8****BCMCAOE 285 -E2: Internet Technologies****24 hours****Theory/Week: 2 Hrs****I.A: 10****Credits: 1****Exam: 40****Course Objectives:**

Help students

- Learn basics, components of Network, Internet and Web technology;
- Learn basics of Internet technology, such as http and the World Wide Web, HTML, and JavaScripts;
- create WWW pages to serve as front-end to client/server, Internet applications;

Course outcomes:

- Be skilled, at a beginners' level, at analyzing and designing Internet applications; implement the design using the client/server model; testing and documenting the solutions developed.

UNIT-I**12 Hrs.**

Computer Networks: Introduction to computer network, LAN, MAN, WAN, wireless LAN, internet, intranet, extranet. Network Models: Client/ server network and Peer-to-peer network, OSI, TCP/IP, layers and functionalities. Internet Applications: Internet as a global network, Search Engine, Online education, Internet utilities – email, online banking, reservations etc. Use of Computers in Education and Research: Data analysis, Heterogeneous storage, e-Library, Google Scholar, Domain specific packages such as SPSS, SciLab, Mathematica etc. Internet Terms: Web page, Home page, website, internet browsers, URL, Hypertext, ISP, Web server, download and upload, online and offline. Internet Applications: www, telnet, ftp, e-mail, social networks, search engines, Video Conferencing, e-Commerce, m-Commerce, VOIP, blogs.

UNIT-II**12 Hrs.**

Introduction to Web Design: Introduction to hypertext markup language (html) Document type definition, creating web pages, lists, hyperlinks, tables, web forms, inserting images, frames, hosting options and domain name registration. Customized Features: Cascading Style Sheet (CSS) for text formatting and other manipulations. JavaScript Fundamentals: Data types and variables, functions, methods and events, controlling program flow, JavaScript object model, built-in objects and operators.

Text Books:

1. Andrew S. Tanenbaum, David J. Wetherall, **Computer Networks**, PHI, 1999.
2. D.R. Brooks, **An Introduction to HTML and Javascript for Scientists and Engineers**, Springer, 2007.
3. Laura Lemay, Rafe Colburn, Jennifer Kyrnin, **Mastering HTML, CSS & Javascript Web Publishing**, BPB, 2016

Reference Books:

1. B. A. Forouzan, **Data Communication and Networking**, TMH, 2007
2. Thomas Powell, **HTML & CSS: The Complete Reference**, Fifth Edition, McGraw Hill Education, 2017
3. William Fischer, **HTML: QuickStart Guide - Creating an Effective Website (HTML, CSS, Javascript)**, Createspace Independent Publishing Platform, 2016

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V SEMESTER

Courses Group	Course Code	Course	Instruction Hours/Week	Duration of exams (Hrs)	Marks & Credits			
					IA	Exam	Total	Credits
I	BCMCAC331	VB.NET Programming	05	3	30	120	150	3
	BCMCAC332	E1: Computer Graphics and Animation	04	3	20	80	100	2
	BCMCAC333	E2: Android Application						
	BCMCAC334	E3: Programming for Analytics						
	BCMCAP 335 BCMCAP 336 BCMCAP 337	E1: VB and Computer Graphics Lab / E2: VB and Android Application Lab / E3: VB and Programming for Analytics Lab	03	3	10	40	50	1
Total			12	09	60	240	300	6

GROUP-I	BCMCAC 331: VB.NET Programming	60 hours	
COURSE-9			
Theory/Week: 5 Hrs			I.A: 20
Credits: 2			Exam: 80

Course Objectives:

- Enable students to gain knowledge in the basic concepts of object-oriented programming and programming with Windows and use skills to develop modern software programs using Visual Basic.

Course Outcomes:

After completion of the course, students are expected to:

- have developed the ability to design and develop interactive applications using the object-oriented principles
- be able to effectively develop applications with full functionality and a graphical user interface using Visual Basic
- have the capability of analysing and finding suitable and effective solutions to Windows based applications

UNIT-I**15 Hrs.**

Introduction: Introduction to .Net, .Net Architecture, Features of .Net, Advantages of .Net, .Net Base Class Library, Overview of .Net Framework, languages and the .NET Framework, The structure of a .NET Application, Compilation and Execution of a .NET Application, .Net Framework Class Library, VB .Net Enhancements. **Introduction to Visual Basic.Net IDE:** Creating a project, Types of project in .Net, Exploring and coding a project, Solution explorer, toolbox, properties window, Output window, Object Browser.

UNIT-II**15 Hrs**

Object Oriented Features: Classes and Objects, Access Specifiers: Private, Public and Protected, Building Classes, Reusability, Constructors, Destructor, Inheritance, Overloading, Overriding, Polymorphism. **VB.Net Programming Language:** Variables, Comments, Data Types, Working with Data Structures – Arrays, Array Lists, Enumerations, Constants, Structures; Introduction to procedures & functions, calling procedures, argument passing mechanisms, scope of variable. **Control Flow Statements:** Conditional statement, Loops, Nesting of Loops. Exception Handling(using : Try-catch, Multiple catch, Finally, Resume next)

UNIT-III**15 Hrs.**

GUI Programming: Introduction to Window Applications, Using Form – Common Controls, Properties, Methods and Events. Interacting with controls – Windows Form, Textbox, Rich Text Box, Label, Button, Listbox, Combobox, Checkbox, Picture Box, Radio Button, Panel, Scroll Bar, Timer, ListView, TreeView, Toolbar, Status Bar. Progress Bar, Date time Picker, Month Calender, Track Bar, Splitter, Link Label, Group Box, Tooltip, Menustrip, Check List Box. **Dialog Controls:** PageSetupDialog, PrintDialog, PrintPreviewDialog, PrintPreviewControl, PrintDocument, OpenFileDialog, SaveFileDialog. **Multiple Document Interface:** Creating and Using MDI applications, CreatingDialogBox, Adding and removing Controls at runtime.

UNIT-IV**15 Hrs**

Error Handling in Windows Forms: Types of Validation: Data validation, Field Level validation, Using the Error Provider class: Public Properties of ErrProvider objects, Public methods of Error Provider class, Performing Data Validation in Controls, Handling Mouse Events, Handling Keyboard Events. **Working With Database:** Data Access with ADO.net, The ODBC architecture, OLE DB, ActiveX Data Objects (ADO), ADO Object Model, Connection Object, Recordset Object, ADO.NET Data Providers, Connected Data Access, Connecting to a SQL Server Data Provider : Using OLEDB Provider, Using Commands, Using Data Reader, Disconnected Data Sets, Data Adapters, Creating the Data Set manually, Using XML Data, Working with DataBase, Queries, Creating the Database, Adding, Deleting & Updating Records.

Text Book:

1. Steven Holzner, **Visual Basic.Net Programming Black Book**, Dreamtech Press, 2005

Reference Books:

2. Neetu, Pabreja, Dr. Kavita Narwal, **Learning Visual Basic.Net Programming (front end design tool)**, Galgotia Publishing Company, 2017.
3. Jeremy Shapiro, **Visual Basic(R).Net: The Complete Reference**, McGraw Hill Education; 1 edition, 2017.

GROUP-I **BCMCAC 332- E1: Graphics and Animation Application** **48 hours**
COURSE-10

Theory/Week: 5 Hrs

I.A: 20

Credits: 2

Exam: 80

Course Objectives:

Enable students to

- understand the structure of modern computer graphics systems, the basic principles of implementing graphics primitives, and familiarity with key algorithms
- learn design and problem-solving skills with application packages

Course Outcomes:

- Apply skills in computer graphics and animation in design and development of simple projects

UNIT-I

12 Hrs

Introduction to Computer Graphics: Overview of Computer Graphics, Computer Graphics Application and Software, Description of some graphics devices, Input Devices for Operator Interaction, Active and Passive Graphics Devices, Display Technologies, Storage Tube Graphics Displays, Calligraphic Refresh Graphics Displays, Raster Refresh (Raster-Scan) Graphics Displays, Cathode Ray Tube Basics, Color CRT Raster Scan Basics, Video Basics, The Video Controller, RandomScan Display Processor, LCD Displays. **Scan Conversion:** Digital Differential Analyzer (DDA) algorithm, Bresenham's Line drawing algorithm. Bresenham's method of Circle drawing **Two-dimensional Transformations:** Transformations and Matrices, Transformation Conventions, 2D Transformations, Homogeneous Coordinates and Matrix Representation of 2D Transformations, Translations and Homogeneous Coordinates, Rotation, Reflection, Scaling, Combined Transformation, Transformation of Points, Transformation of the Unit Square, Solid Body Transformations, Rotation about an Arbitrary Point, Reflection through an Arbitrary Line, A Geometric Interpretation of Homogeneous Coordinates, The Window-to-Viewport Transformations. **Three-dimensional Transformations:** Three-dimensional Scaling, Three-dimensional Shearing, Three-dimensional Rotation, Three-dimensional Reflection, Three-dimensional Translation, Multiple Transformation, Rotation about an Arbitrary Axis in Space, **Computer Animation:** Principles of Animation, Key framing, Deformations, Character Animation, Physics-based Animation, Procedural Techniques, Groups of Objects. Image Manipulation and Storage: What is an Image? Digital image file formats, Image compression standard – JPEG, Image Processing – Digital image enhancement, contrast stretching, Histogram Equalization, Smoothing and Median Filtering.

UNIT-II

12 Hrs.

Photoshop: Getting started with Photoshop, Opening an Existing File, The Photoshop Program Window, Screen Modes, Saving Files, Reverting Files, Closing Files, Preferences, Working With Images: Vector and bitmap Images, Image Size, Image Resolution, Editing Images, Opening Files created in Illustrator or Freehand, color Modes, Setting a current Foreground and Background Colors, File Formats, Making Selection, The Grow and Similar Commands, Moving a Portion of an Image, Editing Selections, Copying a Selection in to another Image, Filling a Selection, Transforming selections, Painting, Drawing and Retouching Tools: The Painting Tools, The Drawing tools, The Retouching Tools., Layers Palette, Working with Layers, , Layer Effects Type, Creating Type, Type Tool, Moving the Text, Creating Paragraph Type, Resizing a bounding Box, Changing the Type settings, Converting the Point Type to Paragraph Type, Converting Type Layers to Standard Layers, Type Making Filters: The Filter Menu, Filter Gallery, Extract Filter, Liquify Filter, Vanishing Point Filter, Artistic Filters, Blur Filters, Brush Stroke Filters, Distort Filters, Noise Filters, Pixelate Filters, Lighting Effects, Difference Clouds, Sharpen Filters, Sketch Filters, Stylize Filters, Other Filters

UNIT-III

12 Hrs.

Introduction to Illustrator: Introduction - Interface - window/palettes/menus Bitmap vs vector graphics, resolution/print theory, Drawing basics: New documents - document setup, Basic shapes - rectangles/ellipses, Viewing - preview/outline, Object stacking order: Selecting and modifying shapes, Colour - fills and strokes, Selections - Selection and Direct select tools, Magic Wand and Lasso selections, Simple drawing - Shaper tool - 'predictive' drawing, Pencil tool - freehand drawing, Paintbrush and Blob brush tools, Eraser/Scissors/Knife, Curvature tool - simple, smooth, more accurate shapes, Drawing - pen tool - Drawing with the pen tool, Modify shapes - cut, join, align, Alignment/smart guides, Drawing using guides, drawing over a template. Transformations - Free transform tool, Cutting/joining paths, Fills and textures - Colour theory - RGB/CMYK, Colours - creating, editing, sharing Spot colours - Pantone, Creating Patterns Creating Gradients, Libraries - sharing/accessing various elements throughout Illustrator and CC

Transformations - Free Transform tool, Scale, rotates, reflect and shear tools, repeating transformations, Editing - Grouping/Locking/Visibility, Isolation mode, Edit colours - edit colours throughout a graphic, Symbols - Symbols - updateable graphics, Modifying symbols, Layers Introduction to layers, controlling layers - viewing/locking/printing, Saving and file formats - Saving - file types - ai, eps, pdf... Exporting - file types, Preferences Configuring preferences - units, increments, grids/guides, interface...

New art boards Artboard tool - rotating/moving/resizing, Styling Brushes art/scatter/calligraphic/bristle/ pattern, Effects - Applying editable effects as bitmap or vector Type, Type characteristics - size/leading/tracking... Point and area type tools Importing type Threading text boxes Text wrap, Touch type tool - adjust individual letters Clipping masks- Masking objects - draw inside and Clipping Masks

UNIT-IV

12 Hrs.

Introduction to Flash: Introduction to 2D animation using Flash, 2. Vector graphics, Flash layout & interface, 3. Shapes & objects, 4. Transformation tools, 5. Colors, palettes, text, 6. Frame , key frames, layering, 7. Sounds & video, 8. Shape tween, symbols, 9. Motion tween, masking, 10. Character design & character animation 11. Action script 12. Publishing & exporting flash files 13. Project work

Text Books:

1. Ashish Shah & Kiran Gurbani, **Computer Graphics and Animation**, Himalaya Publishing House, 2018
2. Kogent Learning Solutions Inc., **Flash CS6 in Simple Steps**, Dreamtech Press, 2013

Reference Books:

1. M.C. Trivedi, **Computer Graphics & Animation**, Jaico Publishing House, 2009.
2. Saish Jain, **Photoshop CS6 Training Guide**, BPB Publications, 2014
3. William Heldman, **Adobe Flash Professional CS6 Essentials**, John Wiley, 2012

**GROUP-I
COURSE-11**

BCMCAC 333: E2: Android Programming

48 hours

Theory/Week: 5 Hrs

I.A: 20

Credits: 2

Exam: 80

Course Objectives

A student will learn the basics of Android platform and understand

- practical approach to Android mobile application development
- Writing simple GUI applications, using built-in widgets and components, working with the database to store data locally.
- The purpose different development tools for Android, design a graphical user interface, integrate an application with pre-existing third-party libraries, access location-based services
- **Course Outcomes:**
- Apply the skills for creating, deploying Android applications, with particular emphasis on software engineering topics including software architecture, software process, usability, and deployment.
- To use the knowledge of android architecture and the tools for developing android applications

UNIT-I

12 Hrs.

Introduction Android : Android Versions, Features of Android, Architecture of Android Obtaining the Required Tools, Android SDK, Installing the Android SDK Tools Configuring the Android SDK Manager – Eclipse, Android Development Tools (ADT), Creating Android Virtual Devices (AVDs), Creating Your First Android Application – Types of Android Application, Anatomy of an Android Application.

UNIT-II

12 Hrs.

Activities, Fragments and Intents: Understanding Activities, Creating Activities, Linking Activities Using Intents, Resolving Intent Filter Collision, Returning Results from an Intent, Passing Data Using an Intent Object, Fragments, Adding Fragments Dynamically, Life Cycle of a Fragment, Interactions between Fragments, Calling Built-In Applications Using Intents, Understanding the Intent Object, Using Intent Filters – Adding Categories, Displaying Notifications.

UNIT-III

12 Hrs.

Android User Interface: Understanding the Components of a Screen, Adapting to Display Orientation Managing Changes to Screen Orientation, Utilizing the Action Bar, Creating the User Interface Programmatically, Listening for UI Notifications, Designing Your User Interface With Views, Using Basic Views, Using Picker Views, Using List Views to Display Long Lists, Understanding Specialized Fragments – Displaying Pictures And Menus With Views, Using Image Views to Display Pictures – Using Menus with Views, Additional Views.

UNIT-IV

12 Hrs.

Databases, Content Providers and Messaging: Saving and Loading User Preferences, Persisting Data to Files, Creating and Using Databases, Content Providers, Sharing Data in Android, Using a Content Provider, Creating Your Own Content Providers, Using the Content Provider – Messaging, SMS Messaging, Sending E,mail, Location Based Services, Networking and Android Services: Location Based Services, Displaying Maps, Getting Location Data, Monitoring a Location, Project - Building a Location Tracker, Networking, Consuming Web Services Using HTTP, Consuming JSON Services, Sockets Programming Developing. Android Services, Creating Your Own Services, Establishing Communication between a Service and an Activity, Binding Activities to Services, Understanding Threading, Publishing Android Applications, Preparing for Publishing, Deploying APK Files.

Text Books:

1. Wei - Meng Lee, **Beginning Android 4 Application Development**, John Wiley & Sons, Inc. 2016
2. Reto Meier, **Professional Android 4 Application Development**, John Wiley & Sons, Inc. 2016

Reference Books:

1. John Horton, **Android Programming for Beginners**, Packt Publishing Limited 2015
2. J. F. DiMarzio, **Beginning Android Programming with Android Studio**, 4ed, Wiley 2016

GROUP-I
COURSE-12 **BCMCAC 334: E3: Programming for Analytics** **48 hours**
Theory/Week: 5 Hrs **I.A: 20**
Credits: 2 **Exam: 80**

Course Objectives

A student will learn the basics of Programming for Data Analytics

- Practical approaches to SQL, SAS,R and Python programming
- Provide exposure to advanced data analytics in the IT industries

Course Outcomes:

- Students can enrich their basic data analytics skills as hand on experience

UNIT-I **12 Hrs.**

Introduction: Database Management Systems: Definition, Characteristics of DBMS, Architecture & Security, Types of Data Models, Concepts and constraints of RDBMS, Introduction to Structured Query Language, MySql Installer, and Download sample Database, Loading Sample Database.

UNIT-II **12 Hrs.**

Introduction: Database Management Systems: Definition, Characteristics of DBMS, Architecture & Security, Types of Data Models, Concepts and constraints of RDBMS, Introduction to Structured Query Language, MySql Installer, Download sample Database, Loading Sample Database.

UNIT-III **12 Hrs.**

Basics of SAS : Introduction to SAS, Installation of SAS university Edition, prerequisites for data analysis using SAS, SAS Architecture, Data Types, Formats and Informat, SAS coding- Data step and proc step, Libraries, Importing external data, Reading and Manipulating Data, Functions, Data Transformations, Conditional Statements.

UNIT-IV **12 Hrs.**

Python: Basics of Python: Installation of Anaconda Navigator, Data types – string, tuples, set, lists, dictionary, Arrays. Spyder, Importing and Exporting Files, Data Manipulation, Descriptive **Statistics and Documentation with Jupyter. R Programming:** Basics of R, Installation of R studio, Vectors, Matrices, Data types, Importing files, Writing files, Merging Files, Data Manipulation, Creation and Deletion of New Variables, Sorting of Data, Functions, Graphical Presentation and Descriptive Statistics.

Text Books:

1. Dye , MYSQL in a nutshell. O' Reilly,2008
2. Delwiche and Slaughter, SAS: The little SAS Book. SAS Institute,2012
3. McKinney Python for Data Analysis. O' Reilly,2017
4. Grolemond. R : Hands-on Programming; Garrett, O' Reilly,2014

Reference Books:

1. DuBois, MySQL cookbook. O' Reilly,2014
2. Hemedinger & McDaniel, SAS for dummies. Wiley,2010
3. Madhavan, Mastering Python for Data Science. Packt,2015
4. Paul. (2011). R: R Cookbook. O' Reilly,2011

Group-I Practical-V	BCMCAP 335- E1: VB and Computer Graphics Lab / BCMCAP 336- E2: VB and Android Application Lab / BCMCAP 337-E3: VB and Programming for Analytics Lab	36 hours
Practical/Week: 3 Hrs Credits: 1	Exercises on Elective chosen Lab	I.A: 10 Exam:40

MANGALORE UNIVERSITY
B.Com- Computer Applications (Vocational) Degree Programme
Curriculum and Scheme of Examinations

VI SEMESTER

Courses Group	Course Code	Course	Instruction Hours/Week	Duration of exams (Hrs)	Marks & Credits			
					IA	Exam	Total	Credits
I	BCMCAC381	Software Engineering	04	3	20	80	100	2
	BCMCAC382	E1: Software Testing	04	3	20	80	100	2
	BCMCAC383	E2: E-Commerce						
	BCMCAC384	E3: Information Security and Cyber Laws						
BCMCAC385	Project	04	-	20	80	100	2	
		Total	12	06	60	240	300	6

**GROUP-I
COURSE-12**

BCMCAC 381: Software Engineering

48 hours

Theory/Week: 4 Hrs

I.A: 20

Credits: 2

Exam: 80

Course Objectives:

- To enable the student in understanding the basic theory of software engineering, and to apply these basic theoretical principles to a software development project.

Course outcomes:

- Ability to gather and specify requirements of the software projects.
- Ability to analyze software requirements with existing tools
- Able to differentiate different testing methodologies
- Able to understand and apply the basic project management practices in real life projects
- Ability to work in a team as well as independently on software projects

UNIT-I

12 Hrs.

Introduction: The Software Problem, Software Engineering Problem, The Software Engineering Approach. **Software Processes:** Software Process, Characteristics of a Software Process, Software Development Process, Waterfall Model, Prototyping, Iterative Enhancement, Spiral Model, Project Management Process, Phases of management process, Metrics, Measurement, and Models, Software Configuration Management Process, Configuration Identification, Change control, Status accounting and auditing, Process Management Process, Building estimation models, Process Improvement and maturity.

UNIT-II

12 Hrs.

Software Requirements Analysis and Specification: Software Requirements, Need for SRS, Requirement process, Problem Analysis, Analysis Issues, Informal Approach, Structured Analysis, Prototyping, Requirements Specification, Characteristics of an SRS, Components of an SRS, Specification Languages, Structure of a Requirements Document, Validation, Requirement Reviews. **Preliminary Design :** Design Principles, Module-Level Concepts, Design Notation and Specification, Data Flow Diagrams, Structured Design Methodology, Verification.

UNIT-III

12 Hrs.

Detailed Design : Module specification, Specifying functional module, Detailed design, PDL, Logic/Algorithm Design, Verification, Design Walkthroughs, Critical Design Reviews, Consistency checkers. **Coding :** Programming Practice, Top-Down and Bottom-Up, Structured Programming, Information Hiding, Programming Style, Internal Documentation, Verification, Code Reading, Static Analysis, Symbolic Execution, Proving Correctness, Code Inspections or Reviews, Unit Testing

UNIT-IV

12 Hrs.

Testing and Maintenance: Testing Fundamentals, Error, Fault, and Failure, Test Oracles, Top-Down and Bottom-Up Approaches, Test Cases and Test Criteria, Psychology of Testing, Functional Testing, Equivalence class partitioning, Boundary value analysis, Cause-effect graphing, Structural Testing, Control flow based criteria, Data flow based testing, Preventive and Corrective Maintenance activities

Text Books:

1. Pankaj Jalote, **Software Engineering: A Precise Approach**, Wiley,2010.

Reference Books:

1. Roger Pressman, **Software Engineering: A Practitioner's Approach**, McGraw Hill Education, 7 edition ,2017.

**GROUP-I
COURSE-13****BCMCAC 382-E1: Software Testing****48 hours****Theory/Week: 4 Hrs****I.A: 20****Credits: 2****Exam: 80****Course Objectives**

- To enable a clear understanding and knowledge of the foundations, techniques, and tools in the area of software testing and its practice in the industry

Course Outcomes

- A student will be able to plan, develop, and execute an automated test plan.
-

	UNIT-I	12 Hrs.
Software Testing Introduction, Nature of errors, Testing principles & Testing fundamentals, Debugging Approaches to Testing - I White Box Testing, Black Box Testing, Gray Box Testing, Unit Testing Integration- Top-down, Bottom up Big Bang Sandwich		
	UNIT-II	12 Hrs.
Testing for Specialized Environments Testing GUI's, Testing of Client/Server Architectures, Testing Documentation and Help Facilities, Testing for Real Time Systems		
	UNIT-III	12 Hrs.
Software Testing Strategies & Software metrics Validation Testing, System Testing, verification, Performance Testing, Regression Testing, Agile testing, Acceptance testing, Smoke Testing, Load Testing, Introduction, Basic Metrics, Complexity Metrics		
	UNIT-IV	12 Hrs.
Specialized Testing & Testing Tools (Introduction) Test Case Design, Junit, Apache, Winrunner, Loadrunner, Rational Robot, Selenium, JMeter		

Text Books:

- Baris Beizerm, **Software Testing techniques**, Dreamtech, Second edition
- Roger Pressman, **Software Engineering: A Practitioner's Approach**, McGraw Hill Education, 7 edition, 2017.
- Dr. K.V.K.K. Prasad, **Software Testing Tools**, Dreamtech
- Paul C. Jorgensen, **Software Testing: A Craftsman's Approach**, CRC Press; Fourth Edition, 2014.

Reference Books:

- Michal Young Mauro Pezze, **Software Testing and Analysis: Process, Principles and Techniques**, Wiley
- Prasad Raghavendra, **Learning Selenium Testing Tools**, Packt Publishing Limited, Third Edition
- Satya Avasarala, **Selenium Web Driver Practical Guide**, Packt Publishing Limited
- Bayo Erinle, **Performance Testing with JMeter 3**, Third Edition, Packt Publishing Limited 2017

GROUP-I	BCMCAC 383-E2: E-Commerce	48 hours
COURSE-14		
Theory/Week: 4 Hrs		I.A: 20
Credits: 2		Exam: 80

Course Objectives

- Introduce concepts and principles E-commerce, modern technologies used to simplify business and banking processes through e-commerce, virtual transactions, provision of E-commerce services, infrastructure, frameworks of web based and mobile systems for E-Commerce applications

Course Outcomes

At the end of the course the students will be fully aware of:

- the principles and practice of Electronic Commerce
- the components, functions and roles of the Electronic Commerce environment.
- client/server infrastructure, E-Commerce payment systems.

UNIT-I 12 Hrs.

INTRODUCTION TO E-COMMERCE: Benefits; impact of e-commerce; classification of ecommerce; application of e-commerce technology; business models; framework of e-commerce.; business to business; business to customer; customer to customer; advantages and disadvantages of ecommerce; electronic commerce environment and opportunities: back ground – the electronic commerce environment – electronic market place technologies.

UNIT-II 12 Hrs.**NETWORK INFRASTRUCTURE OF E-COMMERCE:**

Network infrastructure to ecommerce & internet; LAN; ethernet (IEEE 802.3); WAN; internet; tcp/ip reference model; domain names; internet industry structure; FTP applications; protocols required for ecommerce; HTTP; CGI 3; firewalls; securing web service; secure payment system transaction security (SET); cryptology; digital signatures

UNIT-III 12 Hrs.

ELECTRONIC PAYMENT SYSTEM and EDI: Introduction to electronic cash and electronic payment schemes – internet monetary payment; different models; framework; prepaid and post-paid payment model and security requirements – payment and purchase order process – online electronic cash. Search tools: directories; search engines; Meta search engines. EDI & E-content: Business Trade Cycle; EDI; EDI Fact, Electronic content.

UNIT-IV 12 Hrs.

E-BUSSINESS: Business requirements – concepts; payment processing. launching your e-business- marketing an e-business; public relations; consumer communication; news groups & forums; exchanging links; web rings; e-business back end systems; business record maintenance; back up procedures and disaster recovery plans.

M-COMMERCE, ADVERTISING: Introduction to mobile commerce; framework; applications; design methodology and advantages; future trends in m-commerce. Supply chain management in e-commerce. Internet Advertising; Models of Internet advertising; sponsoring content; Corporate Website; Weaknesses in Internet advertising; web auctions. E-retailing; Role of retailing in E-commerce; E-marketing and advertising.

Text Books:

1. Dave Chaffey, **E-business and E-commerce Management**, Pearson Education, 2009

Reference Books:

1. Kalakota, Ravi, Whinston Andrew B, **E-Commerce-A Manager's guide**, Addison Wesley, 1997.
2. David Whiteley, **E-Commerce: Strategy, Technologies and Applications**, 1st Edition, TMH, 2017
3. Pandey, Saurabh Shukla, **E-Commerce & Mobile Commerce Technologies**, S. Chand, 2015

GROUP-I **BCMCAC 383-E3: Information Security and Cyber** **48 hours**
COURSE-15 **Laws**

Theory/Week: 4 Hrs

I.A: 20

Credits: 2

Exam: 80

Course Objectives

- Students will learn the basics of Information Security, anatomy of information Security attacks, their countermeasures and fundamentals of Cyber Law

Course Outcomes

- Develop an understanding of principal concepts, major issues, technologies and basic approaches in information security, security policies, Cyber Laws for Information security

UNIT-I

12 Hrs.

Introduction to Information Systems and Security: Information Systems, Types of IS, Development of IS, Introduction to Information Security, Need for Information Security, Threats to Information Systems, Information Assurance, Cyber Security

UNIT-II

12 Hrs.

Introduction to Application Security and Counter Measures: Introduction to Application Security, Data Security Considerations, Security Technologies, Security Threats, Security Threats to E-Commerce, E-Cash and Electronic Payment System, Credit/Debit/Smart Cards, Digital Signature, Cryptography and Encryption

UNIT-III

12 Hrs.

Introduction to Security Measures: Secure Information System Development, Application Development Security, Information Security Governance and Risk Management, Security Architecture and Design, Security Issues in Hardware, Data Storage, and Downloadable Devices, Physical Security of IT Assets, Backup Security Measures

UNIT-IV

12 Hrs.

Introduction to Security Policies and Cyber Laws: Need for an Information Security Policy, Information Security Standards – ISO, Introducing Various Security Policies and Their Review Process, Introduction to Indian Cyber Law, Objective and Scope of the IT Act, 2000, Intellectual Property Issues, Overview of Intellectual-Property-Related Legislation in India, Patent, Copyright, Law Related to Semiconductor Layout and Design, Software License

Text Books:

1. Surya Prakash Tripathi, **Introduction to Information Security and Cyber Laws**, Wiley,2014

Reference Books:

1. Michael Whitman, Herbert Mattord, **Principles of Information Security**, Cengage Learning Custom Publishing; 6th edition, 2017.

GROUP-I COURSE-16	BCMCAC 384: Project	48 Hours
Theory/Week: 4 Hrs Credits: 2	Project Work - 4 hrs per week	I A: 20 Exam: 80

CA353: Project

PROJECT GUIDELINES

Preamble: Project work has been made a part of the course to give students exposure in development of quality software solution. The primary emphasis of the project work is to understand and gain the knowledge of the principles of software engineering practices. As such, during the development of the project students shall involve themselves in all the stages of the software development life cycle (SDLC) like requirements analysis, systems design, software development/coding, testing and documentation, with an overall emphasis on the development of reliable software systems. Since, the project work spans over the entire final semester, the students shall be advised to take up projects for solving problems of software industry or any research organization or the real-life problems suggested by the faculty in-charge of Project work in the institutions. Topics thus selected, should be complex and large enough to justify as the course project. The project should be genuine and original in nature and should not be copied from anywhere else.

GENERAL GUIDELINES TO THE INSTITUTIONS

Calendar of Project Work shall be announced before the commencement of the Sixth semester. Calendar shall contain tentative schedules on submission of Project proposals, Project Acceptance, Project Synopsis, Problem Analysis document, System Design, Detailed Design, coding and testing, final report, internal assessment exams (at least two), Viva/Voce etc.

Students shall undertake projects with real life problems (that has direct relevance in day- to-day activities or to knowledge extension) either in their colleges or in industry/research and development laboratories/software companies as recommended by the faculty in-charge of project work in the institutions. If a student intends to do industry project, the faculty in- charge shall ensure that the projects are genuine and original in nature.

There shall be not more than three members in a Project team.

At least two internal assessment exams shall be conducted to evaluate the progress made by the students at different stages of project work. Such exams may include written tests, presentations, work demonstration, group discussion, viva-voce etc. so as to objectively assess the understanding gained by the students in course of their project work.

GUIDELINES TO EXAMINERS REGARDING PROJECT VIVA-VOCE

External and internal Examiners shall together conduct project viva-voce objectively. To begin with, the finer details about various points contained in the scheme of valuation may be conclusively agreed upon through mutual consultation. During project evaluation, a student shall present his/her work through live demonstration of the software application developed as a part of project. The students shall be enabled to present their work in entirety. The primary objective of project evaluation shall be to assess the extent of

effort that was put in to meet the objectives of the project and also to gauge the understanding gained by the students in course of their project works.

While evaluating Project Reports, examiners shall scrutinize whether Software Development Life Cycle (SDLC) principles have been consistently followed in the project work and the same are documented well in the Reports. However, the relative and overall emphasis of these principles to a particular problem domain chosen may be considered so that project evaluations remain fair and objective.

The following is the scheme of valuation:

Sl.No.	Details		Allocated Marks
I.	Report- Max Marks : 60		
	i.	Requirements Analysis	20
	ii.	Systems design/detailed design	15
	iii.	Coding	15
	iv.	Testing and documentation	05
	v.	Other mandatory documents and information	05
II.	Demonstration/ Presentation/Viva - Max. Marks : 20		
	i	Demonstration	10
	ii	Viva - voce (Question and Answer)	10
Total Marks			80

FORMAT OF PROJECT SYNOPSIS

1. The project proposal (Synopsis) should contain the following details:
2. Title of the Project.
3. Introduction and objectives of the Project.
4. Project Category (Database/Web Application/ Client-server/Networking/ Multimedia/ gaming etc.).
5. Tools / Platform, Hardware and Software Requirement specifications.
6. Analysis (DFDs at least up to second level, ER Diagrams/ Class Diagrams, Database Design etc. as per the project requirements).
7. A complete structure which includes:
8. Number of modules and their description to provide an estimation of the student's effort on the project, Data Structures as per the project requirements for all the modules, Process logic of each module, Testing process to be used, Reports generation (Mention tentative content of report).
9. Whether Industry Defined/Client Defined/User Defined Project? Mention the type. Mention the Name and Address of the Industry/Client.
10. Limitation of the project.
11. Future scope and further enhancement of the project.