Progressive Education Society`s
Modern College of Arts, Science and Commerce (Autonomous), Shivajinagar, Pune – 05.

B. B. A. (CA) Dept.: Course Structure

SYBBA (CA) Semester 3 (From AY 2020-21)

Course Type	Course Code	Course / Paper Title	Teaching Scheme Hours / Week			Credit
			Theory	**Tutorial**	**Practical**	
CCT-1	**19BaBbcU301**	**Object oriented programming using C++**	4 lect / week	--	--	3
CCT-2	**19BaBbcU302**	**Relational Database Management Systems (RDBMS)**	4	--	--	3
CCT-3	**19BaBbcU303**	**Quantitative Techniques**	4	--	--	3
CCT-4	**19BaBbcU304**	**Business Application (HRM, Marketing, Production and Operation Management)**	4	--	--	3
CCT-5	**19BaBbcU305**	**Software Engineering**	4	--	--	3
CCT-6	19BaBbcU306	Practical: C++	--	--	2 Lect Hrs / week	2
CCT-7	19BaBbcU307	Practical: RDBMS	--	--	2 Lect Hrs / week	2
AECC-1	19BaBbcU308	Environmental Science - I	--	--	--	1
AECC-2	19BaBbcU309	Business Communication - I	--	--	--	2.5
		Total credit				**22.5**

CCT: Core Courses Theory
SEC: Skill Enhancement Courses
DEC: Discipline Elective Courses
AECC: Ability Enhancement Compulsory Courses
MOOC: Massive Open Online Courses

Course Name: B.B.A. (CA) Semester: III
Subject Code: 19BaBbcU301
Subject Name: Object oriented programming using C++

Course Objectives:
- C++ is very close to hardware, so you get a chance to work at a low level which gives you lot of control in terms of memory management, better performance and finally a robust software development.
- C++ programming gives you a clear understanding about Object Oriented Programming.
- C++ is the most widely used programming languages in application and system programming.
- C++ really teaches you the difference between compiler, linker and loader, different data types, storage classes, variable types their scopes etc.

Course Outcome:
- Student will able to do Object Oriented Programs.
- Students will learn to reuse the code, in lower development costs.
- C++ is a popular programming language.
- Student will easily learn languages such as C++ is close to C# and Java, it makes it easy for programmers to switch to C++ or vice versa.

Chapter 1	Introduction to C++	02 Lectures
	1.1 Basic concepts of OOP, benefits, applications of OOP 1.2 A simple C++ program 1.3 Structure of C++ program 1.4 Creating a source file, compiling and Linking	
Chapter 2	**Tokens, Expressions and Control structures**	**08**

	2.1 Introduction
	2.2 Tokens, keywords, Identifiers and constants
	2.3 Data types - Basic, User defined and Derived
	2.4 Symbolic constant
	2.5 Type Compatibility
	2.6 Variables - Declaration and Dynamic initialization
	2.7 Reference variable
	2.8 Operators in C++
	    2.8.1 Scope resolution operator
	    2.8.2.Member Referencing operators
	    2.8.3Memory management operators
	    2.8.4 Manipulators
	    2.8.5 Type cast operators
	2.9 Expression and their types
	2.10 Special Assignment Expressions
	2.11 Implicit conversions	

	2.12 Operator precedence 2.13 Control structures – if-else, do-while, for, switch	
Chapter 3	**Functions in C++**	**05**
	3.1 Introduction 3.2 The main function 3.3 Function prototyping 3.4 Call by value and Call by reference 3.5 Return by reference 3.6 Inline function – Making an outside function Inline 3.7 Arguments - default, constant	
Chapter 4	**Classes and Objects**	**10**
	4.1 Introduction 4.2 Creating a class and objects 4.3 Defining member functions inside and outside class definition 4.4 Nesting of member functions 4.5 Private member functions 4.6 Arrays within a class 4.7 Memory allocation of objects 4.8 Static data members and static member functions 4.9 Array of objects 4.10 Objects as function arguments 4.11 Friend functions 4.12 Returning objects 4.13 Constructors 4.13.1 Types of constructor 4.14 Destructors	
Chapter 5	**Inheritance**	**09**
	5.1 Introduction 5.2 Base class and derived class examples 5.3 Types of Inheritance 5.4 Virtual base class 5.5 Abstract class 5.6 Constructors in derived class	
Chapter 6	**Polymorphism**	**07**

	6.1 Compile Time Polymorphism
	    6.1.1 Function overloading
	    6.1.2 Operator Overloading Introduction
	    6.1.3 Overloading unary and binary operator
	    6.1.4 Overloading using friend function
	    6.1.5 Overloading insertion and extraction operators
	    6.1.6 String manipulation using operator overloading
	6.2 Runtime Polymorphism
	    6.2.1 this Pointer, pointers to objects, pointer to derived classes
	    6.2.2 Virtual functions and pure virtual functions	

Chapter 7	**Working with Files & Exception Handling**	**05**
	7.1 Exception Handling: Introduction 7.2 Working with Files - Classes for File Stream operations	

	7.3 File operations - Opening, Closing and updating 7.4 Error handling during File operations 7.5 Command Line arguments 7.6 Introduction to Binary files.	
Chapter 8	**Templates**	**01**
	8.1 Introduction 8.2 Class Templates 8.3 Function Templates	
	Guidance / Discussions on specific experiential learning through field work	**01**
	Total:	**48**

Recommended Books:
1) Object oriented programming with C++ - by E Balagurusamy
2) Object Oriented Programming with C++ by Robert Lafore
3) Object Oriented Programming in C++ by Dr. G. T. Thampi, Dr. S. S. Mantha, DreamTech Press.
4) Modern C++ Object Oriented Programming by Margit Antal
5) Advanced Programming with C++ by Tim Love
6) C++ Programming by Wikibooks.

Web Links:
1) www.tutorialspoint.com›cplusplus
2) www.programiz.com›cpp-programming
3) www.w3schools.com›cpp

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Prof. Pratap P. Patil   Prof. Dr. M.D. Alandikar   Dr. R.S. Zunjarrao
Head,   Vice-Principal,   Principal
BBA (CA) Department   Commerce faculty

Course Contents

Course Name: B.B.A. (CA) Semester: III
Subject Code: 19BaBbcU302
Subject Name: Relational Database Management System

Course Objectives:
- To learn about the history and future direction of SQL standard.
- To get an overall appreciation of a modern RDBMS and the nature of the RDBMS.
- Familiarization with the course environment and data to be used.

Course Outcome:
- Master the basic concepts and appreciate the applications of database systems.
- Master the basics of SQL and construct queries using SQL.
- Be familiar with a commercial relational database system (Oracle) by writing SQL using the system.
- Be familiar with the relational database theory, and be able to write relational algebra expressions for queries.
- Mater sound design principles for logical design of databases, including the E-R method and normalization approach.
- Master the basics of query evaluation techniques and query optimization.
- Be familiar with the basic issues of transaction processing and concurrency control.

Chapter 1	Introduction To RDBMS	05 Lectures
	1.1 Introduction to popular RDBMS product and their features 1.2 Architecture of RDBMS 1.3 Difference Between DBMS and RDBMS 1.4 Relationship among application programs and RDBMS	
Chapter 2	PLSQL	12

	2.1 Overview of PLSQL
	2.2 Data Types
	2.3 PLSQL Block
	      2.3.1 % type, % rowtype
	      2.3.2 Operators, Functions, comparison, numeric, character, date
	      2.3.3 Control Statement
	2.4 Exception Handling
	      2.4.1 Predefined
	      2.4.2 User defined exceptions
	2.5 Functions, Procedures
	2.6 Cursor
	      2.6.1 Definition
	      2.6.2 Types of cursor- implicit, explicit (attributes)
	      2.6.3 Parameterized cursor
	2.7 Trigger
	2.8 Package	

Chapter 3	Transaction Management	10
	3.1 Transaction Concept	
	3.2 Transaction Properties	
	3.3 Transaction States	
	3.4 Concurrent Execution	
	3.5 Serializability	
	3.5.1 Conflict Serializability	
	3.5.2 View Serializability	
	3.6 Recoverability	
	3.6.1 Recoverable Schedule	
	3.6.2 Cascadless Schedule	
Chapter 4	Concurrency Control	10
	4.1 Lock Based Protocol	
	4.1.1 Locks	
	4.1.2 Granting of Locks	
	4.1.3 Two Phase Locking Protocol	
	4.2 Timestamp Based Protocol	
	4.2.1 Timestamp	
	4.2.2 Timestamp ordering protocol	
	4.2.3 Thomas's Write Rule	
	4.3 Validation Based Protocol	
	4.4 Deadlock Handling	
	4.4.1 Deadlock Prevention	
	4.4.2 Deadlock Detection	
	4.4.3 Deadlock Recovery	
Chapter 5	Recovery System	10
	5.1 Failure Classification	
	5.1.1 Transaction Failure	
	5.1.2 System Crash	
	5.1.3 Disk Failure	
	5.2 Storage Structures	
	5.2.1 Storage Types	
	5.2.2 Data Access	
	5.3 Recovery & Atomicity	
	5.3.1 Log based Recovery	
	5.3.2 Deferred Database Modification	
	5.3.3 Immediate Database Modification	
	5.3.4 Checkpoints	
	5.4 Recovery with Concurrent Transaction	
	5.4.1 Transaction Rollback	
	5.4.2 Restart Recovery	
	5.5 Remote Backup System	
	Guidance / Discussions on specific experiential learning through field work	**01**
	Total:	**48**

Recommended Books:
1) Database System Concepts by Silberschatz, Korth, Sudershan, 5th Edition.
2) Database Management System by Bipin Desai
3) SQL/PLSQL the programming language of oracle by Ivan Bayross, 2nd edition.

4) An Introduction to Database Systems by C. J. Date, A. Kannan, S. Swamynathan, 8th Edition, Pearson Education.
5) Database Management Systems by Raghu Ramakrishnan, Johannes Gehrke, Publication: McGraw-Hill.
6) The Database Systems - The Complete Book by H. G. Molina, J. D. Ullman, J. Widom Pearson Education.

Web Links:
1) http://www.freebookcentre.net/Database/Free-Oracle-Books-Download.html
2) http://www.rjspm.com/PDF/BCA-428%20Oracle.pdf

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Head,   Vice-Principal,   Principal
BBA (CA) Department   Commerce faculty

Course Name: B.B.A. (CA) Semester: III
Subject Code: 19BaBbcU303
Subject Name: Quantitative Techniques

Course Objectives:
- Apply the most widely used quantitative techniques in decision making.
- Grasps the wide applicability of quantitative techniques.
- Apply mathematics to technical problems in business management.
- Appreciate the value of mathematical reasoning and analysis in daily life situation.
- Realize the Importance of certain mathematical techniques in getting the best possible solution to a problem involving limited resources.

Course Outcome:
- Identify the source of a quantifiable problem, recognize the issues involved and produce an appropriate action plan.
- Distinguish between different mathematical techniques and applications.
- Translate a problem into a simple mathematical model to allow easier understanding and to aid problem solving.
- Extrapolate from data the important trends in order to forecast as accurately as possible
- Employ appropriate mathematical tools to solve problems.
- Calculate and interpret numerous statistical values and appreciate their value to the business manager.
- Demonstrate an ability to apply statistical process control.

Chapter 1	Ratio, Proportion and Percentage	8 lectures
	1.1 Ratio- Definition, Continued Ratio, Inverse Ratio 1.2 Mean, median and mode 1.3 Proportion, Continued Proportion, Direct Proportion, Inverse Proportion 1.4 Percentage- Meaning and Computations of Percentages	
Chapter 2	Matrices And Determinants (up to order 3 only)	10
	2.1 Multivariable data, Definition of a Matrix, Types of Matrices, Algebra of Matrices 2.2 Determinants 2.3 Adjoint of a Matrix, Inverse of a Matrix via adjoint Matrix 2.4 Homogeneous System of Linear equations, Condition for Uniqueness for the homogeneous System	
Chapter 3	Linear Programming problem (L.P.P.)	10
	3.1 Meaning of LPP, Terms and concepts 3.2 Formulation of LPP 3.3 Solution by graphical method	

Chapter 4	Transportation problem (T.P.)	10
	4.1 Statement and meaning of T.P. 4.2 Methods of finding initial basic feasible solution by North West corner Rule, Matrix Minimum method and Vogel's approximation method, Simple numerical problems (concept of degeneracy is not expected).	
Chapter 5	PERT and CPM	09

	5.1 PERT:
	    Meaning, introduction, application, examples
	5.2 CPM:
	    Activity diagram, network diagram, working methodology, Critical path, calculation of project duration.	

	Guidance / Discussions on specific experiential learning through field work.	01
	Total:	48

Recommended Books:
1) Business Mathematics by Dr. Amarnath Dikshit & Dr. Jinendra Kumar Jain.
2) Business Mathematics by V. K. Kapoor, Sultan Chand & sons, Delhi
3) Business Mathematics by Bari, New Literature publishing company, Mumbai
4) Operations Research by Dr. S. D. Sharma, Sultan Chand & Sons.
5) Statistics by D. C. Gupta, S. C. Gupta, Indira Gupta.
6) Quantitative Techniques by L. C. Jhamb
7) Operations Research Theory & Applications by J. K. Sharma, 3rd edition, Macmillan India Ltd.
8) Operations Research by P. K. Gupta and D. S. Hira, S. Chand & co.

Web Links:
1) https://swayam.gov.in
2) http://www.pondiuni.edu.in/storage/dde/downloads/mbaii_qt.pdf

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        Head,   Vice-Principal,   Principal
BBA (CA) Department   Commerce faculty

Course Contents

Course Name: B.B.A. (CA) Semester: III
Subject Code: 19BaBbcU304
Subject Name: Business Application (HRM, Marketing, Production and Operation
              Management)

Course Objectives:
- To ensure the availability of right people for right jobs so as the organizational goals are achieved effectively.
- To set the marketing strategy in order to achieve the overall organizational objectives.
- To produce the things in desired quantity at desired time so that they may be made available to end users when they demand it.
- To utilize the resources of the organization, to create such products or services that satisfy the needs of the consumers, by providing "right thing at the right price, place and time" in Operation Management.

Course Outcome:
- Understand the concept of human resource management and to understand its relevance in organizations and to analyses the strategic issues and strategies, integrate the knowledge of HR concepts to take correct business decisions.
- Students can demonstrate strong conceptual knowledge in the functional area of marketing management, effective understanding of relevant functional areas of marketing management and its application, analytical skills in identification and resolution of problems pertaining to marketing management.
- Explain the various parts of processes and their interaction with other business functions (strategy, engineering, finance, marketing, HRM, project management and innovation)

Chapter 1	Human Resource Management System	10 lectures
	1.1 Employee Database and Knowledge Management System 1.2 Recruitment – Technique 1.3 Employee Appraisal – Performance Efficiency 1.4 Employee Training 1.5 Leave Accounting and Payroll 1.6 Case Study on Human Resource Management	
Chapter 2	**Manufacturing / Production Planning Control System**	**10**
	2.1 Capacity Requirements Planning for Equipment, MRP-I 2.2 Manpower and Time, Material Resource Planning, MRP-II 2.3 Production Planning – Work Order Management- EOQ 2.4 Material Procurement –Indenting, Purchasing, Vendor Analysis, BOM, Supplier Bill Passing & Receipt of material 2.5 Case Study on Manufacturing / Production Planning and	

	Control.		
Chapter 3	**Marketing and Sales**		**8**
	3.1 Marketing: Basic concepts, Introduction to 7'P of marketing		
	3.2 Sales Budgeting-Market Segments/Customer/Product		
	3.3 Customer Enquiry and Preparation of Quotation		
	3.4 Customer Order Processing		
	3.5 Pending Customer Orders		
	3.6 Sales Analysis		
	Case Study on Sales Analysis with specific reference to Shopping Mall / Sales Organization		
Chapter 4	**Banking**		**8**
	4.1 Saving Bank Account Processing – Opening, Cancellation, Transfer, Transaction (Deposit, Withdrawal), Cheque Book issue process of Saving Account		
	4.2 ATM Application		
	4.3 E-Banking		
	4.4 Biometric Devices and its scope in Applications		
	4.5 Case Study on Banking		
Chapter 5	**Advanced Business System**		**11**
	5.1 Enterprises Resource Planning-Evaluation, Scope, Package ERP Solution Vs Custom Development Features of ERP, Different Modules of ERP, Selection of ERP Software		
	5.2 Supply Chain Management (SCM)		
	5.3 Customer Relationship Management (CRM): CRM covers Marketing, Sales and Service functions of a Company, CRM Process, Customer Acquisition / Development, Retention, Call Centre / Knowledge Centre, KPO's, BPO's		
	5.4 International Business Management- Basic Concept, Market Potential opportunities, Competitive Advantage		
	5.5 TQM – Total Quality Management, Six Sigma		
	Guidance / Discussions on specific experiential learning through field work		**01**
	Total:		**48**

Recommended Books:
1) Production and Operation Management by Mayer.
2) Human Resource and Personal Management by K. Aswathapa
3) Enterprise Resource Planning and Business Process by M. M. Shaikh
4) Business Applications by Dr. Milind Oka

Web Links:
1) https://www.freebookcentre.net
2) https://bookboon.com/en/hrm-ebooks

3) https://digitalfireflymarketing.com/wp-content/uploads/2017/02/Big-Book-of-Digital-Marketing.pdf
4) https://www.freebookcentre.net/Business/Marketing-and-Sales-Books.html

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Course Contents

Course Name: B.B.A. (CA) Semester: III
Subject Code: 19BaBbcU305
Subject Name: Software Engineering

Course Objectives:
- The aim of the programme in Software Engineering is to provide students with theoretical knowledge and practical skills required in a knowledge-intensive and changing IT industry.
- Student will be confronted with engineering and management problems from all areas of software engineering: 'how do large organizations specify software?', 'how can they ensure sound architectures?', 'what language tools and platforms are available to realize software?', 'how is quality obtained and managed?', 'what are the challenges of decade long software lifetimes?', 'how to turn ideas into successful software startups?', and 'how to act in an industrial development context?'.

Course Outcome:
- Understand the various factors affecting the success of a software development project, becomes aware of project and time management techniques, which may be used to achieve software engineering objectives, to use effective methods, techniques, and tools to design and implement software projects, become families to various phases of software development life cycles, apply theoretical knowledge and practical skills to turn ideas into successful software startups, establish and apply metrics to determine the readiness, quality, and operability of software, systems and products.
- After completing the programme the student is suited for working in the IT industry in professions as for example system developers, programmers or testers.

Chapter 1	Introduction to System Concepts	06 Lectures
	1.1 Definition , Elements of System 1.2 Characteristics of System 1.3 Types of System 1.4 System Concepts	
Chapter 2	Requirement Analysis	08
	2.1 Definition of System Analysis 2.2 Requirement Anticipation 2.3 Knowledge and Qualities of System Analyst 2.4 Role of a System Analyst 2.5 Feasibility Study And It's Types 2.6 Fact Gathering Techniques 2.7 SRS (System Requirement Specification)	
Chapter 3	Introduction to Software Engineering	05
	3.1 Definition Need for software Engineering 3.2 Software Characteristics 3.3 Software Qualities (McCall's Quality Factors)	

Chapter 4	Software Development Methodologies	06
	4.1 SDLC (System Development Life Cycle)	
	4.2 Waterfall Model	
	4.3 Spiral Model	
	4.4 Prototyping Model	
	4.5 RAD Model	
	4.6 Agile Process	
Chapter 5	Analysis and Design Tools	10
	5.1 Entity-Relationship Diagrams (ERD)	
	5.2 Decision Tree and Decision Table	
	5.3 Data Flow Diagrams (DFD)	
	5.4 Data Dictionary	
	5.4.1 Elements of DD	
	5.4.2 Advantage of DD	
	5.5 Pseudo code	
	5.6 Input And Output Design	
	5.7 CASE STUDIES (Based on Above Topic)	
Chapter 6	Structured System Design	06
	6.1 Modules Concepts and Types of Modules	
	6.2 Structured Chart	
	6.3 Qualities of Good Design	
	6.3.1 Coupling, Types of Coupling	
	6.3.2 Cohesion, Types of Cohesion	
Chapter 7	Software Testing	06
	7.1 Definition, Test characteristics	
	7.2 Types of testing	
	7.2.1 Black-Box Testing	
	7.2.2 White-Box Testing	
	7.2.3 Unit testing	
	7.2.4 Integration testing	
	7.3 Validation	
	7.4 Verification	
	Guidance / Discussions on specific experiential learning through field work	**01**
	Total:	**48**

Recommended Books:
1) SADSE (System Analysis Design) by Prof. Khalkar, Prof. Parthasarathy.
2) Software Engineering: A Practitioner's Approach by Roger Pressman
3) Fundamentals of Software Engineering by Mall B.
4) Software Engineering by K. K. Aggarwal.

Web Links:
1) IEEE Software, www.computer.org/software

2) The Software Engineering Body of Knowledge (SWEBOK), www.swebok.org
3) https://www.tutorialspoint.com/software_engineering/index.html.
4) https://www.javatpoint.com/software-engineering-tutorial

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Progressive Education Society`s

Modern College of Arts, Science and Commerce (Autonomous), Shivajinagar, Pune – 05.

B. B. A. (CA) Dept.: Course Structure

SYBBA (CA) Semester 4 (From AY 2020-21)

Course Type	Course Code	Course / Paper Title	Teaching Scheme Hours / Week			Credit
			Theory	Tutorial	Practical	
CCT-1	**19BaBbcU401**	**Data Mining and Data Warehousing**	4 lect / week	--	--	3
CCT-2	**19BaBbcU402**	**C#.NET**	4	--	--	3
CCT-3	**19BaBbcU403**	**Concepts of Operating system**	4	--	--	3
CCT-4	**19BaBbcU404**	**Object oriented Software Engineering**	4	--	--	3
CCT-5	**19BaBbcU405**	**Computer networks**	4	--	--	3
CCT-6	19BaBbcU406	Practical: Object oriented Software Engineering	--	--	2 Lect Hrs / week	2
CCT-7	19BaBbcU407	Practical: C#.NET	--	--	2 Lect Hrs / week	2
AECC-1	19BaBbcU408	Environmental Science - II	--	--	--	1
AECC-2	19BaBbcU409	Business Communication - II	--	--	--	2.5
		Total credit				**22.5**

CCT: Core Courses Theory
SEC: Skill Enhancement Courses
DEC: Discipline Elective Courses
AECC: Ability Enhancement Compulsory Courses
MOOC: Massive Open Online Courses

Course Contents

Course Name: B.B.A. (CA) Semester: IV
Subject Code: 19BaBbcU401
Subject Name: Data Mining and Data Warehousing

Course Objectives:
- To understand the fundamentals of Data Mining.
- To identify the appropriateness and need of mining the data.
- To understand various methods, techniques and algorithms in data mining.
- Be acquainted with the tools and techniques used for Knowledge Discovery in Databases.
- This gives a complete description about the principles, used, architectures, applications, design and implementation of data mining and data ware housing concepts.

Course Outcome:
- Understand Data Warehouse fundamentals, Data Mining Principles.
- Design data warehouse with dimensional modelling and apply OLAP operations.
- Identify appropriate data mining algorithms to solve real world problems.
- Compare and evaluate different data mining techniques like classification, prediction, clustering and association rule mining.
- Describe complex data types with respect to spatial and web mining.
- Benefit the user experiences towards research and innovation integration.

Chapter 1	Data Warehousing	06 Lectures
	1. Data warehousing Components 2. Building a Data warehouse 3. What is Data Mart? 4. Mapping the Data Warehouse to a Multiprocessor Architecture 5. DBMS Schemas for Decision Support 6. Data Extraction, Cleanup, and Transformation Tools 7. Metadata.	
Chapter 2	Business Analysis	12
	1. Reporting and Query tools and Applications 2. Tool Categories 3. The Need for Applications 4. Cognos Impromptu 5. Online Analytical Processing (OLAP) 6. Need – Multidimensional Data Model 7. OLAP Guidelines 8. Multi-dimensional versus Multi-relational OLAP 9. Categories of Tools 10. OLAP Tools and the Internet.	
Chapter 3	Data Mining	08

		1. Introduction 2. Types of Data 3. Data Mining Functionalities 4. Interestingness of Patterns 5. Classification of Data Mining Systems 6. Data Mining Task Primitives 7. Integration of a Data 8. Mining System with a Data Warehouse 9. Data Preprocessing.	
Chapter 4		**Association Rule Mining And Classification**	**12**
		1. Mining Frequent Patterns, Associations and Correlations 2. Mining Methods 3. Mining various 4. Kinds of Association Rules 5. Correlation Analysis 6. Constraint Based Association Mining 7. Classification and Prediction 8. Basic Concepts 9. Decision Tree Induction 10. Bayesian 11. Classification 12. Rule Based Classification 13. Classification by Back propagation 14. Support Vector 15. Machines 16. Associative Classification 17. Lazy Learners 18. Other Classification Methods 19. Prediction.	
Chapter 5		**Clustering And Trends In Data Mining**	**09**
		1. Cluster Analysis 2. Types of Data 3. Categorization of Major Clustering Methods 4. K- means 5. Partitioning Methods 6. Hierarchical Methods 7. Density-Based Methods 8. Grid Based Methods 9. Model-Based Clustering Methods 10. Clustering High Dimensional Data 11. Constraint 12. Based Cluster Analysis 13. Outlier Analysis 14. Data Mining Applications.	
		Guidance / Discussions on specific experiential learning through field work	**01**
		Total:	**48**

Recommended Books:

1) Data Warehousing, Data Mining and OLAP by Alex Berson and Stephen J. Smith, Tata McGraw - Hill Edition, Thirteenth Reprint, 2008.
2) Data Mining Concepts and Techniques by Jiawei Han and Micheline Kamber, Third Edition, Elsevier, 2012.
3) Introduction to Data Mining by Pang-Ning Tan, Michael Steinbach and Vipin Kumar, Person Education, 2007.
4) Insight into Data Mining Theory and Practice by K. P. Soman, Shyam Diwakar and V. Aja, Eastern Economy Edition, Prentice Hall of India, 2006.
5) Introduction to Data Mining with Case Studies by G. K. Gupta, Eastern Economy Edition, Prentice Hall of India, 2006.
6) Data Mining Methods and Models by Daniel T. Larose, Wiley-Inter-science, 2006.
7) Data Mining Techniques-Arun K Pujari 2nd edition
8) Data Mining and Warehousing by Khushboo and Sandeep BPB Publication
9) Data Warehousing Fundamentals by Paulraj Ponnaiah Wiley student Edition.

Web Links:
1) https://www.freebookcentre.net
2) https://www.academia.edu/6489220/Data_Mining_ebook
3) https://www.dei.unipd.it/~capri/SI/MATERIALE/DWDM0405.pdf
4) www.javatpoint.com/data-mining-world-wide-web
5) https://www.javatpoint.com/data-warehouse
6) https://en.wikipedia.org/wiki/Data_mining
7) https://en.wikipedia.org/wiki/Data_warehousing

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Head,   Vice-Principal,   Principal
BBA (CA) Department   Commerce faculty

Course Contents

Course Name: B.B.A. (CA) Semester: IV
Subject Code: 19BaBbcU402
Subject Name: C#.Net

Course Objectives:
The aim of the course is for the students to develop their programming skills to be able to develop structured Windows applications using the C# language and principles of object-oriented programming. Students should gain theoretical and practical knowledge of general programming techniques. This course is also suitable for students with prior programming experience who wish to strengthen their knowledge in object-oriented programming with Windows.

Course Outcome:
On completion of the course the student should be able to:
- Show knowledge and understanding of the fundamental principles of the object-oriented programming, show knowledge and understanding of the fundamentals of writing applications to solve problems.
- Show skills in writing simple but well-documented and structured Windows applications with graphical user interface, show skills in implementing the basic concepts of object-orientation with an in-depth focus on Encapsulation.

Chapter 1	The .Net framework	5 Lectures
	1. Introduction to .NET framework, 2. The Origin of .Net Technology, 3. Common Language Runtime (CLR), 4. Microsoft Intermediate Language (MSIL), 5. Just-In –Time Compilation (JIT), 6. Introduction to MVC (Model View Controller)	
Chapter 2	**Introduction to C#.Net**	**12**
	1. Introduction 2. Advantages & Disadvantages of C# 3. Programming Structure of C# 4. Types of Application- Console and Windows 5. Basic Constructs – Variables, Data types 6. GUI Components / Controls (Windows Forms, Text Boxes, Buttons, Labels, Check Boxes, Radio Buttons, List Boxes, Combo Boxes, Picture Boxes, Timer, Scrollbars, Menus, Built-in Dialogs, Image List, Tree Views, List Views) 7. Creating a Message Box, Input Box, Dialog Box. 8. Handling Events	
Chapter 3	**C#.Net programming**	**7**
	1. Operators. 2. Arrays 3. Functions 4. Control Statements (if statement, if....else statement, nesting of	

	if....else statement, the else if ladder, switch statement), Looping Construct(while statement, do statement, for statement) 5. Namespace		
Chapter 4	**Object Oriented Programming in C#**		**8**
	1. Class and Object, 2. Constructors and Destructors, 3. Inheritance, 4. Interfaces, 5. Access modifiers: Public, Private, Protected, 6. Polymorphism, 7. Overloading and Overriding, 8. Sealed Classes.		
Chapter 5	**Exception handling**		**5**
	1. Types of errors 2. Syntax of exception handling code 3. Try and catch block 4. Multiple Catch Blocks		
Chapter 6	**ADO.Net & Reports**		**10**
	1. Introduction to ADO.Net 2. Components of ADO.Net 3. ADO.Net Data Providers 4. Working with Disconnected Data 5. Introduction to Report, Creating Simple Report.		
	Guidance / Discussions on specific experiential learning through field work		**01**
	Total:		**48**

Recommended Books:

1) Illustrated C# 2008 by Solis, Publication APRESS.
2) Professional C# 4.0 and .NET 4 by Christian Nagel, Bill Evjen, Jay Glynn, Karli Watson,
3) Morgan Skinner, WROX.
4) Beginning C# Object-Oriented Programming by Dan Clark, Apress.
5) ADO.NET Examples and Best Practices for C# Programmers, by Peter Blackburn Apress.
6) Database Programming with C#, by Carsten Thomsen, Apress.
7) Microsoft Visual C# 2013 Step by Step by Sharp, John (2013). Microsoft Press.
8) Pro C# 5.0 and the .NET 4.5 framework by Troelsen, Andrew (2012). 6th edition. New York: APress.

Web Links:
1) https://swayam.gov.in
2) www.codecademy.com

Designed and Checked by:
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Prof. Pratap P. Patil   Prof. Dr. M.D. Alandikar   Dr. R.S. Zunjarrao
Head,   Vice-Principal,   Principal
BBA (CA) Department   Commerce faculty

Course Contents

Course Name: B.B.A. (CA) Semester: IV
Subject Code: 19BaBbcU403
Subject Name: Concepts of Operating System

Course Objectives:
- To learn the fundamentals of Operating Systems, mechanisms of OS to handle processes and threads and their communication.
- To learn the mechanisms involved in memory management in contemporary OS.
- To gain knowledge on distributed operating system concepts that includes architecture, Mutual exclusion algorithms, deadlock detection algorithms and agreement protocols.
- To know the components and management aspects of concurrency management.
- To learn programmatically to implement simple OS mechanisms.

Course Outcome:
- Describe the general architecture of computers.
- Describe, contrast and compare differing structures for operating systems.
- Understand and analyze theory and implementation of: processes, resource control (concurrency etc.), physical and virtual memory, scheduling, I/O and files.

Chapter 1	Introduction to Operating System	04 Lectures
	1.1 What is operating system 1.2 Computer system architecture 1.3 Services provided by OS 1.4 Types of OS	
Chapter 2	**System Structure**	**04**
	2.1 User operating system Interface 2.2 System Calls 2.3 Process or job control 2.4 Device Management 2.5 File Management 2.6 System Program 2.7 Operating System Structure	
Chapter 3	**Process Management**	**03**

	3.1 What is Process
	3.2 Process State
	3.3 Process Control Block
	3.4 Context Switch
	3.5 Operation on Process
	      3.5.1 Process Creation
	      3.5.2 Process Termination	

Chapter 4	**CPU Scheduling**	**10**

	4.1 What is scheduling
	4.2 Scheduling Concepts
	      4.2.1 CPU- I/O Burst Cycle
	      4.2.2 CPU Scheduler
	      4.2.3 Preemptive and Non-preemptive scheduling	

	4.2.4 Dispatcher	
	4.3 Scheduling criteria (Terminologies used in scheduling)	
	4.4 Scheduling Algorithms	
	4.4.1 FCFS	
	4.4.2 SJF (Preemptive & non-preemptive)	
	4.4.3 Priority Scheduling (Preemptive & Non-preemptive)	
	4.4.4 Round Robin Scheduling	
	4.5 Multilevel Queues	
	4.6 Multilevel Feedback queues	
Chapter 5	**Process Synchronization**	**05**
	5.1 Introduction	
	5.2 Critical section problem	
	5.3 Semaphores	
	5.3.1 Concept	
	5.3.2 Implementation	
	5.3.3 Deadlock & Starvation	
	5.3.4 Binary Semaphores	
	5.4 Critical Sections	
	5.5 Classical Problems of synchronization	
	5.6 Bounded buffer problem	
	5.7 Readers & writers problem	
	5.8 Dining Philosophers problem	
Chapter 6	**Deadlock**	**07**
	6.1 Introduction	
	6.2 Deadlock Characterization	
	6.3 Necessary Condition	
	6.4 Resource allocation graph	
	6.5 Deadlock Prevention	
	6.6 Deadlock Avoidance	
	6.6.1 Safe State	
	6.6.2 Resource allocation graph algorithm	
	6.6.3 Bankers algorithm	
	6.7 Deadlock Detection	
	6.8 Recovery from deadlock	
	6.8.1 Process Termination	
	6.8.2 Resource Preemption	
Chapter 7	**Memory Management**	**09**
	7.1 Introduction to memory management	
	7.2 Address Binding	
	7.3 Dynamic Loading	
	7.4 Dynamic Linking	
	7.5 Overlays	
	7.6 Logical vs. physical addresses	
	7.7 Swapping	
	7.8 Contiguous memory allocation	
	7.8.1 Single Partition Allocation	
	7.8.2 Multiple Partition Allocation	
	7.8.3 External and Internal Fragmentation	

	7.9 Paging 7.10 Segmentation 7.11 Segmentation with paging 7.12 Virtual memory 7.13 Demand paging 7.14 Page replacement algorithms: FIFO, MRU, LRU, LRU (approximation using reference bit) MFU, LFU Second Chance algorithm Optimal replacement.	
Chapter 8	**I/O System**	**05**
	9.1 Introduction 9.2 I/O Hardware 9.3 Application of I/O Interface 9.4 Kernel I/O Subsystem 9.5 Disk Scheduling FCFS, Shortest Seek time first, SCAN, C- SCAN, C- Look.	
	Guidance / Discussions on specific experiential learning through field work	**01**
	Total:	**48**

Recommended Books:

1) System Programming and Operating System by D. M. Dhamdhere, 3rd Edition, Tata McGraw- Hill, 2012.
2) Operating System Concepts by Silberschatz, Galvin, Gagne, 5th edition, Addison-Wesley.
3) Operating System by A. Godbole, Tata McGraw-Hill Education, 2005.
4) Modern Operating Systems by A. Tanenbaum, Herbert Bos, 4th Edition, Pearson Education, 2016.
5) Introduction to Operating Systems Concepts and Practice by P. C. P. Bhatt, 3rd Edition, PHI, 2010.
6) Operating systems by Harvey M. Deital, 3rd Edition, Pearson Education, 2011.

Web Links:

1) http://www.freebookcentre.net/CompuScience/Free-Operating-Systems-Books-Downlo ad.html
2) https://www.topfreebooks.org/free-operating-systems-books

Designed and Checked by:

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       Head,   Vice-Principal,   Principal
BBA (CA) Department   Commerce faculty

Course Name: B.B.A. (CA) Semester: IV
Subject Code: 19BaBbcU404
Subject Name: Object Oriented Software Engineering

Course Objectives:
- To learn and understand various OO concepts along with their applicability contexts.
- Given a problem, identify domain objects, their properties, and relationships among them.
- How to identify and model/represent domain constraints on the objects and (or) on their relationships.
- Develop design solutions for problems on various OO concepts.
- To learn various modeling techniques to model different perspectives of object-oriented software design (UML).
- To learn software development life cycle for Object-Oriented solutions for Real-World Problems.
- To learn OO design solutions for the recurring problems.

Course Outcome:

- Display understanding and the ability to apply object-oriented programming principles.
- Have detailed knowledge of the software development lifecycle.
- Apply skills relevant for academic progression and career development within the sector.

Chapter 1	**Object Oriented Concepts, Modeling and UML**	**08 Lectures**

	1.1 What is Object Orientation?
	    (Introduction to class, object, inheritance, polymorphism)
	 1.2 Model
	   1.2.1 Introduction
	   1.2.2 Object Oriented Modeling
	 1.3 Object oriented system development
	   1.3.1 Function/data methods
	   1.3.2 Object oriented analysis
	   1.3.3 Object oriented construction
	   1.3.4 Object oriented testing
	 1.4 Identifying the elements of an object model
	   1.4.1 Identifying classes and objects
	   1.4.2 Specifying the attributes
	   1.4.3 Defining operations
	   1.4.4 Finalizing the object definition
	 1.5 Introduction to UML
	 1.6 Overview of UML
	 1.7 Conceptual Model of UML
	 1.8 Architecture
	 1.9 Advantages of UML	

Chapter 2	**Basic and Advanced Structural Modeling**	**12**

	2.1 Classes and Relationship 2.2 Common mechanism 2.3 Diagrams 2.4 Class diagram 2.5 Advanced classes 2.6 Advanced Relationship 2.7 Interface, Types and Roles 2.8 Packages 2.9 Object Diagram (Case study on Class diagram)	
Chapter 3	**Basic Behavioral and Architectural Modeling**	**13**
	3.1 Use cases, Use Case Diagram 3.2 Interaction Diagram 3.3 Sequence Diagram 3.4 Activity Diagram 3.5 State Chart Diagram 3.6 Collaboration Diagram 3.7 Components Diagram 3.8 Deployment Diagram (Minimum 2 case studies for each diagram)	
Chapter 4	**Object Oriented Analysis**	**08**

	4.1 Iterative Development
	4.2 Understanding requirements
	4.3 Unified process & UP Phases
	    4.3.1 Inception
	    4.3.2 Elaboration
	    4.3.3 Construction
	    4.3.4 Transition	

Chapter 5	**Object Oriented Design**	**06**

	5.1 The Booch Method, The Coad and Yourdon Method and Jacobson
	    and Rambaugh Method
	5.2 System Design process
	    5.2.1 Partitioning the analysis model
	    5.2.2 Concurrency and subsystem allocation
	    5.2.3 Task Management component
	    5.2.4 Data Management component
	    5.2.5 Resource Management component
	    5.2.6 Inter sub-system communication
	5.3 Object Design process	

	Guidance / Discussions on specific experiential learning through field work	**01**
	Total:	**48**

Recommended Books:
1) The Unified Modeling Language User Guide by Grady Booch, James Raumbaugh, Ivar Jacobson.
2) Object Oriented Software Engineering by Ivar Jacobson
3) Software Engineering by Pressman.
4) Sams Teach Yourself UML in 24 Hours, Complete Starter Kit by Joseph Schmuller, 3rd Edition.
5) Object Oriented Modeling and Design with UML by Michael R. Blaha.

Web Links:
1) http://en.wikipedia.org/wiki/Object-oriented_software_engineering
2) http://portal.acm.org/citation.cfm?id=107216
3) http://www.smartdraw.com/tutorials/software-oose/oose.htm?exp=sof

Designed and Checked by:

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Head,   Vice-Principal,   Principal
BBA (CA) Department   Commerce faculty

Course Name: B.B.A. (CA) Semester: IV
Subject Code: 19BaBbcU405
Subject Name: Computer networking

Course Objectives:
At the end of the course, the students will be able to:
- Build an understanding of the fundamental concepts of computer networking.
- Familiarize the student with the basic taxonomy and terminology of the computer networking area.
- Introduce the student to advanced networking concepts, preparing the student for entry Advanced courses in computer networking.
- Allow the student to gain expertise in some specific areas of networking such as the design and maintenance of individual networks.

Course Outcome:
After completing this course the student must demonstrate the knowledge and ability to:
- Independently understand basic computer network technology.
- Understand and explain Data Communications System and its components.
- Identify the different types of network topologies and protocols.
- Identify the different types of network devices and their functions within a network.
- Understand and building the skills of sub-netting and routing mechanisms.
- Familiarity with the basic protocols of computer networks, and how they can be used to assist in network design and implementation.

Chapter 1	Basics of Computer Networks	08 Lectures

	1.1 Computer Network
	    1.1.1 Definition
	    1.1.2 Goals
	    1.1.3 Applications
	    1.1.4 Structure
	    1.1.5 Components
	1.2 Topology
	    1.2.1 Bus
	    1.2.2 Star
	    1.2.3 Ring
	    1.2.4 Mesh
	1.3 Types of Networks
	    1.3.1 LAN, MAN, WAN, Internet
	    1.3.2 Broadcast & Point-To-Point Networks
	1.4 Communication Types
	    1.4.1 Serial
	    1.4.2 Parallel
	1.5 Modes of Communication :
	    1.5.1 Simplex
	    1.5.2 Half Duplex
	    1.5.3 Full Duplex	

	1.6 Server Based LANs & Peer-to-Peer LANs 1.6.1 Comparison of both 1.7 Protocols and Standards	
Chapter 2	**Network Models**	**08**

	2.1 Design issues of the layer
	2.2 Protocol Hierarchy
	2.3 ISO-OSI Reference Model :
	2.3.1 Layers in the OSI Model
	2.3.2 Functions of each layer
	2.4 Terminology
	    2.4.1 SAP
	    2.4.2 Connection Oriented services
	    2.4.3 connectionless services
	    2.4.4 Peer Entities
	2.5 Internet Model (TCP/IP)
	2.6 Comparison of ISO-OSI & TCP/IP Model
	2.7 Addressing
	    2.7.1 Physical Addresses
	    2.7.2 Logical Addresses
	    2.7.3 Port Addresses
	2.8 IP Addressing
	    2.8.1 Classful addressing
	    2.8.2 Classless addressing	

Chapter 3	**Transmission Media**	**10**

	3.1 Guided Media(Wired) :
	    3.1.1 Coaxial Cable:-
	Physical Structure, Standards,
	BNC Connector, Applications
	3.1.2 Twisted Pair :-
	Physical Structure, UTP vs STP,
	Connectors, Applications
	3.1.3 Fiber Optics Cable :-
	Physical Structure,
	Propagation Modes
	(Single Mode & Multimode),
	Connectors, Applications
	3.2 Unguided Media (Wireless)
	    3.2.1 Electromagnetic Spectrum For Wireless
	    Communication
	    3.2.2 Propagation Methods
	        3.2.2.1 Ground,
	        3.2.2.2 Sky,
	        3.2.2.3 Line-Of-Sight
	   3.3.3 Wireless Transmission
	        3.3.3.1 Radio Waves
	        3.3.3.2 Infra-Red,
	        3.3.3.3 Micro-Wave	

Chapter 4	**Wired and Wireless LANs**	**10**
	4.1 IEEE Standards 4.2 Standard Ethernet	

	4.2.1 MAC Sublayer	
	4.2.2 Physical layer	
	4.3 Fast Ethernet	
	4.3.1 MAC Sublayer	
	4.3.2 Physical layer	
	4.4 Gigabit Ethernet	
	4.4.1 MAC Sublayer	
	4.4.2 Physical layer	
	4.5 Network Interface Cards(NIC)	
	4.5.1 Components of NIC	
	4.5.2 Functions of NIC	
	4.5.3 Types of NIC	
	4.6 Wireless LAN	
	4.6.1 IEEE802.11 Architecture	
	4.6.2 MAC Sub layer	
	4.6.3 Frame Format	
	4.6.4 Frame Types	
	4.6.5 Addressing Mechanism	
	4.6.6 Bluetooth	
	(Architecture, Piconet and Scatternet, Applications)	
Chapter 5	**Network Connectivity Devices**	**06**
	5.1 Categories of Connectivity Devices	
	5.1.1 Passive & Active Hubs	
	5.1.2 Repeaters	
	5.1.3 Bridges	
	5.1.3.1 Transparent Bridges (Loop Problem, Spanning Tree)	
	5.1.3.2 Source Routing Bridges	
	5.1.4 Switches	
	5.1.5 Router	
	5.1.6 Gateways	
	5.2 Network Security Devices	
	5.2.1 Firewalls	
	5.2.1.1 Packet-Filter firewall	
	5.2.1.2 Proxy firewall	
Chapter 6	**Internet Basics**	**05**
	6.1 Concept of Intranet & Extranet	
	6.2 Internet Information Server(IIS)	
	6.3 Web Server	
	6.4 World Wide Web(WWW)	
	6.4.1 Architecture,	
	6.4.2 Web Documents:- static, dynamic and active documents	
	6.5 Search Engines	
	6.6 Internet Service Providers(ISP)	
	6.7 HTTP	
	6.7.1 HTTP Transaction	
	6.7.2 Persistent and non-persistent connection	
	6.8 HTTPS	
	Guidance / Discussions on specific experiential learning through field work	**01**
	Total:	**48**

Recommended Books:
1) Computer Networks by Andrew Tanenbaum (III Edition)
2) Data Communications & Networking by Behrouz Ferouzan (III Edition)
3) Complete Guide to Networking by Peter Norton

Web Links:
1) http://intronetworks.cs.luc.edu/current/ComputerNetworks.pdf
2) https://www.pdfdrive.com/computer-networking-books.html
3) https://www.topfreebooks.org/free-books-on-computer-networking

Designed and Checked by:

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