E.G.S. PILLAY ENGINEERING COLLEGE

(Autonomous)

Approved by AICTE, New Delhi | Affiliated to Anna University, Chennai

Accredited by NAAC with 'A' Grade | Accredited by NBA (CSE, EEE, MECH, CIVIL, ECE, IT)

NAGAPATTINAM – 611 002

B.Tech. Computer Science and Business Systems

Full Time Curriculum and Syllabus – R2019

Second Year – Third Semester

Course Code	Course Name	L	T	P	C	Maximum Marks		
						CA	ES	Total
Theory Course								
1902BS301	Formal Language and Automata Theory	3	1	0	4	40	60	100
1902BS302	Computer Organization and Architecture	3	0	0	3	40	60	100
1902BS303	Object Oriented Programming	3	0	0	3	40	60	100
1902BS304	Computational Statistics	3	0	0	3	40	60	100
1902BS305	Software Engineering	3	0	2	4	50	50	100
1902BS306	Financial Management	3	0	0	3	40	60	100
Laboratory Course								
1902BS351	Object Oriented Programming Lab	0	0	2	1	50	50	100
1902BS352	Computational Statistics Lab	0	0	2	1	50	50	100
1904GE351	Life Skills: Soft Skill	0	0	2	1	100	-	100
Audit Course								
1901MCX02	Constitution of India	2	0	0	0	100	-	100

L – Lecture | T – Tutorial | P – Practical | C – Credit | CA – Continuous Assessment | ES – End Semester

1902BS301 FORMAL LANGUAGE AND AUTOMATA THEORY L T P C
3 1 0 4

MODULE I REGULAR LANGUAGES AND FINITE AUTOMATA 12 Hours

Alphabet-languages and grammars- Productions and derivation-Chomsky hierarchy of languages. Regular expressions and languages- Deterministic finite automata (DFA) and equivalence with regular expressions- Nondeterministic finite automata (NFA) and equivalence with DFA- Regular grammars and equivalence with finite automata - Properties of regular languages - Kleene's theorem - Pumping lemma for regular languages- Myhill- Nerode theorem and its uses- Minimization of finite automata.

MODULE II CONTEXT-FREE LANGUAGES AND PUSHDOWN AUTOMATA 12 Hours

Context-free grammars (CFG) and languages (CFL)- Chomsky and Greibach normal forms - Nondeterministic pushdown automata (PDA) and equivalence with CFG - Parse trees- Ambiguity in CFG - Pumping lemma for context-free languages – Deterministic pushdown automata- Closure properties of CFLs.

MODULE III LINEAR BOUNDED AUTOMATA AND TURING MACHINES 12 Hours

Context-sensitive grammars (CSG) and languages - Linear bounded automata and equivalence with CSG. The basic model for Turing machines (TM) - Turing recognizable (recursively enumerable) and Turing- decidable (recursive) languages and their closure properties - Variants of Turing machines - Nondeterministic TMs and equivalence with deterministic TMs - Unrestricted grammars and equivalence with Turing machines – TMs as enumerators.

MODULE IV UNDECIDABILITY 12 Hours

Church-Turing thesis -Universal Turing machine – The universal and diagonalization languages - Reduction between languages – Rice's theorem -Undecidable problems about languages.

MODULE V COMPLEXITY THEORY 12 Hours

Introductory ideas on Time complexity of deterministic and nondeterministic Turing machines - P and NP,NP-completeness - Cook's Theorem, other NP - Complete problems.

TOTAL: 60 HOURS

REFERENCES:

1. John E. Hopcroft, Rajeev Motwani and Jeffrey D. Ullman, Introduction to Automata Theory, Languages, and Computation , Pearson Education, Third Edition, 2014.
2. Harry R. Lewis and Christos. H. Papadimitriou, Elements of The theory of Computation, Pearson Education/PHI, 2007.
3. John C. Martin, Introduction to Languages and the Theory of Computation, TMH, 2007.
4. Micheal Sipser, Introduction of the Theory and Computation, Thomson Brokecole, 2005.
5. M. R. Garey and D. S. Johnson, "Computers and Intractability: A Guide to the Theory of NP Completeness", 1979.
6. https://nptel.ac.in.

1902BS302	COMPUTER ORGANIZATION AND ARCHITECTURE	L	T	P	C
		3	0	0	3

MODULE I INTRODUCTION TO COMPUTER ARCHITECTURE 9 Hours

Functional blocks of a computer: CPU, memory, input-output subsystems, control module. Instruction set architecture of a CPU: Registers, instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set. Outlining instruction sets of some common CPUs.

MODULE II COMPUTER ARITHMETIC 9 Hours

Data representation: Signed number representation, fixed and floating point representations, character representation. Integer addition and subtraction, ripple carry adder, carry look-ahead adder, etc. multiplication – shift-and- add, Booth multiplier, carry save multiplier, etc. Division restoring and non-restoring techniques, floating point arithmetic.

MODULE III CONTROL MODULE AND PIPELINING 9 Hours

Introduction to x86 architecture. CPU control MODULE design: Hardwired and micro-programmed design approaches, design of a simple hypothetical CPU. Pipelining: Basic concepts of pipelining, throughput and speedup, pipeline hazards. Introduction to parallel processing.

MODULE IV PERIPHERAL DEVICES AND THEIR CHARACTERISTICS 9 Hours

Input-output subsystems, I/O device interface, I/O transfers – program controlled, interrupt driven and DMA, privileged and non-privileged instructions, software interrupts and exceptions. Programs and processes – role of interrupts in process state transitions, I/O device interfaces – SCII, USB.

MODULE V MEMORY ORGANIZATION AND SYSTEM DESIGN 9 Hours

Memory interleaving, concept of hierarchical memory organization, cache memory, cache size vs. block size, mapping functions, replacement algorithms, write policies. Memory system design: Semiconductor memory technologies, memory organization.

TOTAL: 45 HOURS

REFERENCES:

1. Morris Mano, “Computer System Architecture” 3rd Edition, Prentice Hall of India, New Delhi, 2014.
2. David A. Patterson and John L. Hennessy, “Computer Organization and Design: The Hardware/Software Interface”, Elsevier, 5th Edition 2013.
3. Carl Hamacher, Zvonko Vranesic, SafwatZaky, Naraig Manjikian, “Computer Organization and Embedded Systems” McGraw-Hill, 6th Edition 2014.
4. John P. Hayes, Computer Architecture and Organization, McGraw-Hill, 3rd Edition, 2013.
5. William Stallings, “Computer Organization and Architecture – Designing for Performance”, 10th Edition, Pearson Education, 2015.
6. Vincent P. Heuring and Harry F. Jordan,” Computer System Design and Architecture”, Prentice Hall, 2nd Edition, 2004.
7. https://nptel.ac.in

1902BS303	OBJECT ORIENTED PROGRAMMING	L	T	P	C
		3	0	0	3

MODULE I INTRODUCTION TO OBJECT ORIENTED PROGRAMMING 9 Hours

Single line comments, Local variable declaration within function scope, function declaration, function overloading, stronger type checking, Reference variable, parameter passing -value vs reference, passing pointer by value or reference, Operator new and delete, the typecasting operator, Inline Functions in contrast to macro, default arguments.

MODULE II CONCEPTS OF OBJECT ORIENTED PROGRAMMING 9 Hours

Necessity for OOP, Data Hiding, Data Abstraction, Encapsulation, Procedural Abstraction, Class and Object, Scope of Class and Scope Resolution Operator, Member Function of a Class, private, protected and public Access Specifier, this Keyword, Constructors and Destructors, friend class, error handling (exception)

MODULE III ESSENTIALS OF OBJECT ORIENTED PROGRAMMIG 9 Hours

Operator overloading, Inheritance, Single and Multiple, Class Hierarchy, Pointers to Objects, Assignment of an Object to another Object, Polymorphism through dynamic binding, Virtual Functions, Overloading, overriding and hiding.

MODULE IV FILES, I/O AND GENERIC PROGRAMMING 9 Hours

Streams, Files, Library functions, formatted output Template concept, class template, function template, template specialization.

MODULE V OBJECT ORIENTED DESIGN AND MODELING 9 Hours

UML concept, Use case for requirement capturing, Class diagram, Activity diagram and Sequence Diagramfor design, Corresponding C++ code from design.

TOTAL: 45 HOURS

REFERENCES:

1. Bjarne Stroustrup, The C++ Programming Language, 1e:3rd Edition, Pearson Education, 2015
2. Debasish Jana, C++ and Object-Oriented Programming Paradigm, 3rd Edition, Prentice Hall of India, New Delhi, 2014.
3. Bjarne Stroustrup, Programming Principles and Practice Using C++, 2nd Edition, Addison Wesley, 2014.
4. Bjarne Stroustrup, The Design and Evolution of C++, Addison-Wesley Professional, 2013.
5. Bjarne Stroustrup, The C++ Programming Language, 1e:3rd Edition, Pearson Education, 2015
6. https://onlinecourses.nptel.ac.in/noc16_cs17/preview
7. https://www.geeksforgeeks.org/basic-concepts-of-object-oriented-programming-using-c/
8. http://www.iitk.ac.in/esc101/05Aug/tutorial/java/concepts/index.html

1902BS304	COMPUTATIONAL STATISTICS	L	T	P	C
		3	0	0	3

MODULE I **MULTIVARIATE NORMAL DISTRIBUTION AND MULTIVARIATE REGRESSION** **9 Hours**

Multivariate Normal Distribution: Multivariate Normal Distribution, Conditional Distribution, Estimation of parameters. Multiple Linear Regression Model: Standard multiple regression models co linearity, outliers, non-normality and autocorrelation, Multivariate Regression: Parameter estimation, Multivariate Analysis of variance and covariance.

MODULE II **DISCRIMINANT ANALYSIS AND PRINCIPAL COMPONENT ANALYSIS** **9 Hours**

Discriminate Analysis: Statistical background, linear discriminate function analysis, Estimating linear discriminate functions and their properties. Principal Component Analysis: Principal components, Algorithm for conducting principal component analysis, H-plot.

MODULE III **FACTOR ANALYSIS AND SEGMENTATION ANALYSIS** **9 Hours**

Factor Analysis: Factor analysis model, Extracting common factors, determining number of factors, Transformation of factor analysis solutions, Factor scores. Clustering and Segmentation Analysis: Introduction, Types of clustering, Correlations and distances, clustering by partitioning methods, hierarchical clustering, overlapping clustering, K-Means Clustering

MODULE IV **PYTHON CONCEPTS AND DATA WRANGLING** **9 Hours**

Python Concepts, Data Structures, Classes: Interpreter, Program Execution, Statements, Expressions, Flow Controls, Functions, Numeric Types, Sequences and Class Constructors, Text & Binary Files - Reading and Writing. Data Wrangling- Combining and Merging Datasets, Reshaping and Pivoting, Data Transformation, String Manipulation, Regular Expressions

MODULE V **DATA AGGREGATION AND VISUALIZATION IN PYTHON** **9 Hours**

Data Aggregation, Group Operations, Time series: Group by Mechanics, Data Aggregation, Group wise Operations and Transformations, Pivot Tables and Cross Tabulations, Time Series Basics, Data Ranges, Frequencies and Shifting. Visualization in Python: Matplotlib package, Plotting Graphs, Controlling Graph, Adding Text, More Graph Types, Getting and setting values, Patches.

TOTAL: 45 HOURS

REFERENCES:

1. T.W. Anderson, “An Introduction to Multivariate Statistical Analysis”, Wiley, 3rd Edition, 2003
2. J.D. Jobson, “Applied Multivariate Data Analysis”, Vol I & II, Springer, 2012
3. Magnus Lie Hetland, “Beginning Python: From Novice to Professional”, Apress, 2nd Edition,2008
4. Stanley A Mulaik, “Foundations of Factor Analysis”, CRC Press, 2nd Edition, 2009
5. Douglas C. Montogomery, Elizabeth A. Peck, G. Geoffrey Vining, “Introduction to Linear Regression Analysis”, Wiley,5th Edition,2012
6. Mark Lutz, “Programming Python”, Shroff Publishers, 3rd Edition, 2006
7. Tim Hall and J-P Stacey, “Python 3 for Absolute Beginners”, Apress, 2009
8. Wes Mc Kinney, “Python for Data Analysis”, O’Reilly, 2018
9. https://onlinecourses.nptel.ac.in/noc19_mg13/preview
10. https://nptel.ac.in/courses/110106064/
11. https://www.analyticsvidhya.com/blog/2016/01/complete-tutorial-learn-data-science-pythonscratch-2/
12. https://github.com/cliburn/Computational-statistics-with-Python/tree/master/

1902BS305	SOFTWARE ENGINEERING	L	T	P	C
		3	0	2	4

MODULE I INTRODUCTION **9 Hours**

Programming in the small vs. programming in the large-Software project failures and importance ofsoftware quality and timely availability-Engineering approach to software development-Role of software engineering towards successful execution of large software projects-Emergence of software engineering asa discipline-Basic concepts of life cycle models – different models and milestones.

MODULE II SOFTWARE PROJECT MANAGEMENT AND ESTIMATION TECHNIQUES **9 Hours**

Project management: Software project planning–identification of activities and resources-Concepts of feasibility study-Techniques for estimation of schedule and effort-Introduction to Software Requirements Specifications (SRS) and requirement elicitation techniques-Techniques for requirement modeling – decision tables, event tables, state transition tables, Petri nets-Requirements documentation through use cases. Estimation techniques: Software cost estimation models and concepts of software engineering economics- Techniques of software project control and reporting-Introduction to measurement of software size- Introduction to software metrics and metrics based control methods.

MODULE III SOFTWARE QUALITY AND RELIABILITY **9 Hours**

Introduction to the concepts of risk and its mitigation -Internal and external qualities-Process and product quality-Principles to achieve software quality-Introduction to different software quality models like McCall,Boehm, FURPS / FURPS+, Dromey, ISO – 9126-Introduction to Capability Maturity Models (CMM and CMMI)-Introduction to software reliability, reliability models and estimation-Measures of code and design quality-Configuration management.

MODULE IV SOFTWARE TESTING **9 Hours**

Introduction to faults and failures-Basic testing concepts-Concepts of verification and validation-Black boxand white box tests-White box test coverage – code coverage, condition coverage, branch coverage- Basic concepts of black-box tests – equivalence classes, boundary value tests, usage of state tables-Testing use cases-Transaction based testing-Testing for non-functional requirements – volume, performance and efficiency-Concepts of inspection.

MODULE V OBJECT ORIENTED ANALYSIS, DESIGN AND CONSTRUCTION **9 Hours**

Concepts – the principles of abstraction, modularity, specification, encapsulation and information hiding- concepts of abstract data type- Introduction to UML-Class Responsibility Collaborator (CRC) model- Quality of design-Design measurements-Concepts of design patterns-Refactoring-Object oriented construction principles-Object oriented metrics.

TOTAL: 45 HOURS

LIST OF EXPERIMENTS:

1. Development of requirements specification.
2. Function oriented design using SA/SD.
3. Object-oriented design using UML.
4. Test case design.
5. Implementation of the designed software using C++ language.
6. Perform Testing using any tool or different strategies.
7. Use of CASE tools and other tools such as configuration management tools.
8. Program analysis tools in the software life cycle.

TOTAL: 30 HOURS

REFERENCES:

1. Ian Sommerville, Software Engineering, Pearson Education, 2016.
2. Ivar Jacobson, Object Oriented Software Engineering: A Use Case Driven Approach, Addison- Wesley Professional, 1992.
3. Carlo Ghezzi, Jazayeri Mehdi and Mandrioli Dino, Fundamentals of Software Engineering, Pearson Education, 2002.
4. Michael Jackson, Software Requirements and Specification: A Lexicon of Practice, Principles and Prejudices, Addison-Wesley Professional, 1995.
5. Ivar Jacobson, Grady Booch and James Rumbaugh, The Unified Development Process, Addison- Wesley Professional, 1999.
6. Erich Gamma, Richard Helm, Ralph Johnson and John Vlissides, Design Patterns: Elements of Object-Oriented Reusable Software, Addison-Wesley Professional, 1994.
7. Norman E Fenton and Shari Lawrence Pfleeger, Software Metrics: A Rigorous and Practical Approach, CRC Press, 2014.
8. https://nptel.ac.in/courses/106101061/
9. https://cosmolearning.org/courses/introduction-to-software-engineering/video-lectures/
10. http://www.nptel.ac.in/courses/Webcourse-contents/IITKharagpur/Soft Engg/New_index1.html

1902BS306	FINANCIAL MANAGEMENT	L	T	P	C
		3	0	0	3

MODULE I INTRODUCTION **9 Hours**

Introduction to Financial Management - Goals of the firm - Financial Environments.

VALUE OF MONEY: Simple and Compound Interest Rates, Amortization, Computing more than once a year, Annuity Factor.

MODULE II VALUATION OF SECURITIES **9 Hours**

Bond Valuation Preferred Stock Valuation, Common Stock Valuation, Concept of Yield and YTM.

RISK AND RETURN: Defining Risk and Return, Using Probability Distributions to Measure Risk, Attitudes Toward Risk, Risk and Return in a Portfolio Context, Diversification, the Capital Asset Pricing Model (CAPM)

MODULE III OPERATING AND FINANCIAL LEVERAGE **9 Hours**

Operating Leverage, Financial Leverage, Total Leverage, Indifference Analysis in leverage study.

COST OF CAPITAL: Concept, Computation of Specific Cost of Capital for Equity - Preference – Debt, Weighted Average Cost of Capital – Factors affecting Cost of Capital 4L.

MODULE IV CAPITAL BUDGETING **9 Hours**

The Capital Budgeting Concept & Process - An Overview, Generating Investment Project Proposals, Estimating Project, After Tax Incremental Operating Cash Flows, Capital Budgeting Techniques, Project Evaluation and Selection - Alternative Methods

MODULE V WORKING CAPITAL MANAGEMENT **9 Hours**

Overview, Working Capital Issues, Financing Current Assets (Short Term and Long Term- Mix), Combining Liability Structures and Current Asset Decisions, Estimation of Working Capital.

CASH MANAGEMENT: Motives for Holding cash, Speeding Up Cash Receipts, Slowing Down Cash Payouts, Electronic Commerce, Outsourcing, Cash Balances to maintain, Factoring.

ACCOUNTS RECEIVABLE MANAGEMENT: Credit and Collection Policies, Analyzing the Credit Applicant, Credit References, Selecting optimum Credit period.

TOTAL: 45 HOURS

REFERENCES:

1. Chandra Prasanna - Financial Management - Theory & Practice, Tata McGraw Hill, 2011.
2. Rajiv Srivastava and Anil Misra : Financial Management, Oxfort University Press, 2011.
3. Van Horne and Wachowicz : Fundamentals of Financial Management, Prentice Hall/ Pearson Education.2009.

1902BS351	OBJECT ORIENTED PROGRAMMING LAB	L	T	P	C
		0	0	2	1

LIST OF EXPERIMENTS:

1. Implementation of classes and objects with constructors and destructors.
2. Implementation of operator and function overloading.
3. Implementation of types of Inheritance.
4. Implementation of two different classes for adding a private data member using friend function.
5. Implementation of file handling operations.
6. Implementation of templates and UML diagrams.

TOTAL: 30 HOURS

REFERENCES:

1. Object Oriented Programming Lab Manual – A. Baskar, AP/CSE, EGSPEC.
2. Bjarne Stroustrup, The C++ Programming Language, 1e:3rd Edition, Pearson Education, 2015.
3. Debasish Jana, C++ and Object-Oriented Programming Paradigm, 3rd Edition, Prentice Hall of India, New Delhi, 2014.
4. Bjarne Stroustrup, Programming Principles and Practice Using C++, 2nd Edition, Addison Wesley, 2014.
5. Bjarne Stroustrup, The Design and Evolution of C++, Addison-Wesley Professional, 2013.

1902BS352	COMPUTATIONAL STATISTICS LAB	L	T	P	C
		0	0	2	1

LIST OF EXPERIMENTS:

1. Basic Python Programs
2. Program using String Operations
3. Program on python Data structures
4. Perform various numpy operations and special functions
5. Draw statistical graphics using seaborn
6. Implement k-means, logistic and time series algorithm using Scikit-learn
7. Multi Variable analysis with regression in python
8. Factor analysis with python
9. Data Aggregation in python
10. Visualization in python using Altair

TOTAL: 30 HOURS

REFERENCES:

1. Computational Statistics Lab Manual – G. Murugan, AP/CSE, EGSPEC.
2. T.W. Anderson, "An Introduction to Multivariate Statistical Analysis", Wiley, 3rd Edition, 2003
3. J.D. Jobson, "Applied Multivariate Data Analysis", Vol I & II, Springer, 2012
4. Magnus Lie Hetland, "Beginning Python: From Novice to Professional", Apress, 2nd Edition,2008
5. Stanley A Mulaik, "Foundations of Factor Analysis", CRC Press, 2nd Edition, 2009
6. Douglas C. Montogomery, Elizabeth A. Peck, G. Geoffrey Vining, "Introduction to Linear Regression Analysis", Wiley,5th Edition,2012
7. Mark Lutz, "Programming Python", Shroff Publishers, 3rd Edition, 2006
8. Tim Hall and J-P Stacey, "Python 3 for Absolute Beginners", Apress, 2009
9. Wes Mc Kinney, "Python for Data Analysis", O'Reilly, 2018

1904GE351	LIFE SKILLS: SOFT SKILL	L	T	P	C
		0	0	2	1

MODULE I INTRODUCTION TO SOFT SKILLS **6 Hours**

Soft Skills an Overview - Basics of Communication – Body Language – Positive attitude –Improving Perception and forming values – Communicating with others.

MODULE II TEAM VS TRUST **6 Hours**

Interpersonal skills – Understanding others – Art of Listening - Group Dynamics –Essential of an effective team - Individual and group presentations - Group interactions – Improved work Relationship .

MODULE III SELLING ONESELF **6 Hours**

How to brand oneself – social media – job hunting – Resume writing – Group Discussion – Mock G.D. Interview skills – Mock Interview.

MODULE IV CORPORATE ETIQUETTE **6 Hours**

What is Etiquette – Key Factors – Greetings – Meeting etiquette – Telephone etiquette – email etiquette – Dining etiquette – Dressing etiquette.

MODULE V LEARNING BY PRACTICE **6 Hours**

1. My family. Myself. 2. Meeting people. Making Contacts. 3. A city. Getting about town. 4. Our flat. Home life. 5. Travelling. Going abroad. 6. Going through Customs.7. At a hotel. 8. Shopping. 9. Eating out. 10. Making a phone call.11.A modern office.12. Discussing business.

TOTAL: 30 HOURS

REFERENCES:

1. Dr. K. Alex, "soft skills", Third Edition, S.Chand& Publishing Pvt Limited, 2009.
2. Arunakoneru, "Professional Communication", Second Edition, Tata McGraw-Hill Education, 2008.
3. D.K.Sarma, "You & Your Career", First Edition Wheeler Publishing & Co Ltd, 1999.
4. Shiv Khera "You Can Win", Third Edition Mac Millan Publisher India Pvt Limited, 2005.

1901MCX02	CONSTITUTION OF INDIA	L	T	P	C
		2	0	0	0

MODULE I

Evolution of the Indian Constitution: 1909 Act, 1919 Act and 1935 Act. Constituent Assembly: Composition and Functions; Fundamental features of the Indian Constitution.

MODULE II

Union Government: Executive-President, Prime Minister, Council of Minister

State Government: Executive: Governor, Chief Minister, Council of Minister

Local Government: Panchayat Raj Institutions, Urban Government

MODULE III

Rights and Duties: Fundamental Rights, Directive principles, Fundamental Duties

MODULE IV

Relation between Federal and Provincial units: Union-State relations, Administrative, legislative and Financial, Inter State council, NITI Ayog, Finance Commission of India

MODULE V

Statutory Institutions: Elections-Election Commission of India, National Human Rights Commission, National Commission for Women

TOTAL: 30 HOURS

REFERENCES:

1. D.D. Basu, Introduction to the constitution of India, Lexis Nexis, New Delhi.
2. Subhash Kashyap, Our Parliament, National Book Trust, New Delhi.
3. Peu Ghosh, Indian Government &Politics, Prentice Hall of India, New Delhi.
4. B.Z. Fadia & Kuldeep Fadia, Indian Government &Politics, Lexis Nexis, New Delhi.