Maulana Abul Kalam Azad University of Technology, West Bengal

(Formerly West Bengal University of Technology)

Syllabus for B. Tech in CSE (Data Science)

(Applicable from the academic session 2020-2021)

Semester-V

Software Engineering
Code:ESC501
Contact: 3L

Name of the Course:	**Software Engineering**
Course Code: **ESC501**	Semester: V
Duration:6 months	Maximum Marks:100

Teaching Scheme	**Examination Scheme**
Theory:3 hrs./week	Mid Semester exam: 15
Tutorial: NIL	Assignment and Quiz: 10 marks
	Attendance: 5 marks
Practical: hrs./week	End Semester Exam:70 Marks
Credit Points: 3	

Unit	Content	Hrs/Unit
1	Overview of System Analysis & Design , Business System Concept, System Development Life Cycle,Waterfall Model , Spiral Model, Feasibility Analysis, Technical Feasibility, Cost-Benefit Analysis, COCOMO model. **[10L]**	10
2	System Design – Context diagram and DFD, Problem Partitioning, Top-Down And Bottom-Updesign; Decision tree, decision table and structured English; Functional vs.Object- Oriented approach. **[5L]**	5
3	Coding & Documentation – Structured Programming, OO Programming, InformationHiding, Reuse, System Documentation. **[4L]** Testing – Levels of Testing, Integration Testing, Test case Specification, Reliability Assessment,Validation & Verification	12
	Metrics, Monitoring & Control. **[8L]**	
4.	Software Project Management – Project Scheduling,Staffing, Software Configuration Management, Quality Assurance, Project Monitoring. **[7L]**	7
5	Static and dynamic models, why modeling, UMLdiagrams: Class diagram, interaction diagram: collaboration diagram, sequence diagram, state chart diagram,activity diagram, implementation diagram. **[10 L]**	10

Text book and Reference books:

1. Pressman, Software Engineering : A practitioner's approach– (TMH)
2. Pankaj Jalote, Software Engineering- (Wiley-India)
3. N.S. Gill, Software Engineering – (Khanna Publishing House)
4. Rajib Mall, Software Engineering- (PHI)
5. Agarwal and Agarwal, Software Engineering – (PHI)
6. Sommerville, Software Engineering – Pearson
7. Martin L. Shooman, Software Engineering – TMH

Statistics for DataScience
Code: PCC-DS 501
Contacts: 3L

Name of the Course:	**Computer Graphics**	
Course Code: **PCC-DS 501**	Semester: V	
Duration: 6 months	Maximum Marks:100	
Teaching Scheme		**Examination Scheme**
Theory:3 hrs./week		Mid Semester exam: 15
Tutorial: NIL		Assignment and Quiz: 10 marks
		Attendance : 5 marks
Practical: NIL		End Semester Exam :70 Marks
Credit Points:	3	

Unit 1: 2L

Introduction: Objective, scope and outcome of the course 1

Unit 2: 4L

Probability models, their properties, combinatorial principle, conditional probability, independence of events.

Unit 3: 6L

Random variable and distributions discrete and continuous distributions, cumulative distribution functions. One dimensional change of variable, joint distributions, joint probability functions, desity functions. Conditional independence

Unit 4: 9L

Expectation: Discrete case & continuous case. Variance, covariance and correlation. Generating functions, Conditional expectation. Sampling distribution and limits. Convergence in probability and distribution. Monte Carlo approximations, Normal distribution.

Unit 5: 12L

Statistical inference. Models for inference. Data collection: finite population, simple random sampling, histograms, survey sampling. Some basic inferences. Likely hood inference. Maximum likely hood estimation, inference based on MLE. Bayesian Inference, prior and poster distributions,

inference estimation, Baysian computations, optimal inference.

Unit 6:8L

Model checking, sample model, residual probality plots, Chisquare test. Stochastic processes, distribution, Markov chains. Poisson processes.

Text Books:

1. Outline of statistics 1 and 2 by Goon-Gupta-Dasgupta

2. Fundamentals of mathematical statistics by Gupta and Kapoor

3. Complete Business Statistics Book By Amir Aczel

4. The Practice of Business Statistics, by Manish Sharma (Khanna)

Operating Systems
Code: PCC-CS502
Contacts: 3L

Name of the Course:	**Operating Systems**
Course Code: PCC-CS502	Semester: V
Duration: 6 months	Maximum Marks:100

Teaching Scheme	**Examination Scheme**
Theory:3 hrs./week	Mid Semester exam: 15
Tutorial: NIL	Assignment and Quiz: 10 marks
	Attendance : 5 marks
Practical: hrs./week	End Semester Exam :70 Marks
Credit Points: 3	

Unit	Content	Hrs/Unit
1	**Introduction:** Concept of Operating Systems, Generations of Operating systems, Types of Operating Systems, OS Services, System Calls, Structureof an OS - Layered, Monolithic, Microkernel Operating Systems, Concept of Virtual Machine. Case study on UNIX and WINDOWS Operating System.	3
2	**Processes:** Definition, Process Relationship, Different states of a Process, Process State transitions, Process Control Block (PCB), Context switching **Thread:** Definition, Various states, Benefits of threads, Types of threads, Concept of multithreads, **Process Scheduling**: Foundation and Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, WaitingTime, Response Time; Scheduling algorithms: Pre- emptive and Non pre-emptive, FCFS, SJF, RR; Multiprocessor scheduling: Real Time scheduling: RM and EDF.	10
3.	**Inter-process Communication:** Critical Section, Race Conditions, Mutual Exclusion, Hardware Solution, Strict Alternation, Peterson's Solution, The Producer Consumer Problem, Semaphores, Event Counters, Monitors, Message Passing, Classical IPC Problems: Reader's & Writer Problem, Dinning Philosopher Problemetc.	5

4.	**Deadlocks:** Definition, Necessary and sufficient conditions for Deadlock, Deadlock Prevention, Deadlock Avoidance: Banker's algorithm, Deadlock detection and Recovery.	5
5.	**Memory Management:** Basic concept, Logical and Physical address map, Memory allocation: Contiguous Memory allocation– Fixed and variable partition– Internal and External fragmentation and Compaction; Paging: Principle of operation –Page allocation Hardware support for paging, Protection and sharing, Disadvantages of paging. **Virtual Memory**: Basics of Virtual Memory – Hardwareand control structures – Locality of reference, Page fault , Working Set , Dirty page/Dirty bit – Demand paging,Page Replacement algorithms: Optimal, First in First Out (FIFO), Second Chance (SC),Not recently used (NRU) and Least Recently used(LRU).	8
6.	**I/O Hardware:** I/O devices, Device controllers, Direct memory access Principles of I/O Software: Goals ofInterrupt handlers, Device drivers, Device independent I/O software, Secondary-Storage Structure: Disk structure, Disk scheduling algorithms **File Management**: Concept of File, Access methods, Filetypes, File operation, Directory structure, File System structure, Allocation methods (contiguous, linked, indexed), Free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency andperformance. **Disk Management:** Disk structure, Disk scheduling - FCFS, SSTF, SCAN, C-SCAN, Disk reliability, Disk formatting, Boot-block, Bad blocks	6

Text book and Reference books:

1. Operating System Concepts Essentials, 9th Edition by AviSilberschatz, Peter Galvin, Greg Gagne, Wiley Asia Student Edition.
2. Operating Systems: Internals and Design Principles, 5th Edition, William Stallings, Prentice Hall of India.
3. Operating System Concepts, Ekta Walia, Khanna Publishing House (AICTE Recommended Textbook – 2018)
4. Operating System: A Design-oriented Approach, 1st Edition by Charles Crowley, Irwin Publishing
5. Operating Systems: A Modern Perspective, 2nd Edition by Gary J. Nutt, Addison- Wesley
6. Design of the Unix Operating Systems, 8th Edition by Maurice Bach, Prentice-Hall of India
7. Understanding the Linux Kernel, 3rd Edition, Daniel P. Bovet, Marco Cesati, O'Reilly and Associates

Object Oriented Programming
Code: PCC-CS 503
Contacts: 3L

Name of the Course:	**Computer Organization**	
Course Code: PCC-CS503	Semester: V	
Duration:6 months	Maximum Marks:100	
Teaching Scheme		**Examination Scheme**
Theory:3 hrs./week		Mid Semester exam: 15
Tutorial: NIL		Assignment and Quiz : 10 marks
		Attendance: 5 marks
Practical: hrs./week		End Semester Exam:70 Marks
Credit Points:	3	

Unit	Content	Hrs/Unit
1	Abstract data types and their specification.How to implement an ADT. Concrete state space, concrete invariant, abstraction function. Implementingoperations, illustrated by the Text example.	8
2	Features of object-oriented programming. Encapsulation, object identity, polymorphism –but not inheritance.	8
3	Inheritance in OO design. Design patterns. Introduction and classification. Theiterator pattern.	6
4	Model-view-controller pattern. Commands as methods and as objects. ImplementingOO language features. Memory management.	6
5	Generic types and collections GUIs. Graphical programming with Scaleand Swing . The software development process	6

Text book and Reference books:

1. R.S. Salaria, mastering Object-Oriented Programming Using C++, Khanna Publishing.
2. Rambaugh, James Michael, Blaha – "Object Oriented Modelling and Design" – Prentice Hall, India
3. Ali Bahrami – "Object Oriented System Development" – Mc Graw Hill
4. Patrick Naughton, Herbert Schildt – "The complete reference-Java2" – TMH
5. R.K Das – "Core Java For Beginners" – VIKAS PUBLISHING
6. Deitel and Deitel – "Java How to Program" – 6th Ed. – Pearson
7. Ivor Horton's Beginning Java 2 SDK – Wrox
8. E. Balagurusamy – " Programming With Java: A Primer" – 3rd Ed. – TMH

Introduction to Industrial Management (Humanities III)
Code: HSMC-501
Contacts: 3L

Name of the Course:	**Introduction to Industrial Management (Humanities III)**
Course Code: HSMC-501	Semester: V
Duration:6 months	Maximum Marks:100

Teaching Scheme	**Examination Scheme**
Theory:3 hrs./week	Mid Semester exam: 15
Tutorial: NIL	Assignment and Quiz : 10 marks
	Attendance: 5 marks
Practical: NIL	End Semester Exam:70 Marks
Credit Points: 3	

Unit	Content	Hrs/Unit
1	**Introduction** System- concept, definition, types, parameters, variables and behavior. Management – definition andfunctions. Organization structure: i. Definition. ii. Goals. iii. Factors considered in formulatingstructure. iv. Types. v. Advantages and disadvantages. vi. Applications. Concept, meaning and importance of division of labor, scalar & functional processes, span of control, delegation of authority, centralization and decentralization in industrial management. Organizational culture and climate –meaning, differences and factors affecting them. Moral-factors affecting moral. Relationship between moral andproductivity. Job satisfaction- factors influencing jobsatisfaction. Important provisions of factory act andlabor laws.	6
2	**Critical Path Method (CPM) andProgramme Evaluation Review Technique (PERT):** 2.1 CPM & PERT-meaning, features, difference, applications. 2.2 Understand different terms used in network diagram. Draw network diagram for a real lifeproject containing 10-15 activities, computation of LPO and EPO.(Take minimum three examples). Determination of critical path onnetwork. Floats, its types and determination offloats. Crashing of network, updating and itsapplications.	8

3	**Materials Management:** Material management-definition, functions, importance, relationship withother departments. Purchase - objectives, purchasing systems, purchase procedure, terms andforms used in purchase department. Storekeeping- functions, classification of stores as centralized and decentralized with their advantages, disadvantages andapplication in actual practice. Functions of store, types of records maintained by store, various types and applications of storage equipment, needand general methods for codification ofstores. Inventory control: i. Definition. ii. Objectives. iii. Derivation for expression for Economic Order Quantity (EOQ) and numeric examples. iv. ABC analysis andother modern methods of analysis. v. Various types of inventory models such as Wilson's inventory model, replenishment model and two bin model. (Only sketch and understanding, no derivation.). 3.6 Material Requirement Planning (MRP)- concept, applications and brief details about software packages available in market.	6
4	**Production planning and Control(PPC):** Types and examples of production. PPC : i. Need and importance. ii. Functions. iii. Forms used and their importance. iv. General approach foreach type of production. Scheduling- meaning and need forproductivity and utilisation. Gantt chart- Format and method toprepare. Critical ratio scheduling-method andnumeric examples. Scheduling using Gantt Chart (for atleast 5-7 components having 5-6 machining operations, with processes, setting and operation time for each component and process, resources available, quantity and other necessarydata), At least two examples. 4.7 Bottlenecking- meaning, effect andways to reduce.	8
5	**Value Analysis (VA) and Cost Control:** 5.1 VA-definition, terms used, process andimportance. 5.2 VA flow diagram. DARSIRI method of VA. Case study of VA-at least two. Waste-types, sources and ways to reduce them. Cost control-methods and important guide lines.	4
6	**Recent Trends in IM:** ERP (Enterprise resource planning) - concept,features and applications. Important features of MS Project. Logistics- concept, need and benefits. Just in Time (JIT)-concept and benefits. Supply chain management-concept and benefits.	4

Text book and Reference books:

1. L.S. Srinath– "CPM & PERT principles and Applications".
2. Buffa – "Modern Production Management".
3. N. Nair – "Materials Management".
4. O. P. Khanna – " Industrial Engineering & Management".
5. Mikes – "Value Analysis".
6. S.C. Sharma, "Engineering Management – Industrial Engineering & Management", Khanna Book Publishing Company, New Delhi

Theory of Computation
Code:PEC-DS 501A
Contacts: 3L

Name of the Course:	**Theory of Computation**	
Course Code: **PEC-DS501A**	Semester: V	
Duration: 6 months	Maximum Marks:100	
Teaching Scheme		**Examination Scheme**
Theory:3 hrs./week		Mid Semester exam: 15
Tutorial: NIL		Assignment and Quiz: 10 marks
		Attendance : 5 marks
Practical: NIL		End Semester Exam :70 Marks
Credit Points:	3	

Unit	Content	Hrs/U nit
1	Fundamentals: Basic definition of sequential circuit, block diagram, mathematical representation, concept of transition table and transition diagram (Relating of Automata concept to sequential circuit concept) Design of sequence detector, Introduction to finite state model [2L] Finite state machine: Definitions, capability & state equivalent, kth-equivalent concept [1L] Merger graph, Merger table, Compatibility graph [1L] Finite memory definiteness, testing table & testing graph. [1L] Deterministic finite automaton and non deterministic finite automaton.[1L] Transition diagrams and Language recognizers. [1L] Finite Automata: NFA with Î transitions - Significance, acceptance of languages. [1L] Conversions and Equivalence: Equivalence between NFA with and without Î transitions. NFA to DFA conversion. [2L] Minimization of FSM, Equivalence between two FSM's , Limitationsof FSM [1L] Application of finite automata, Finite Automata with output- Moore & Melay machine. [2L]	13
2	Regular Languages : Regular sets. [1L] Regular expressions, identity rules. Arden's theorem state and prove[1L] Constructing finite Automata for a given regular expressions, Regularstring accepted by NFA/DFA [1L] Pumping lemma of regular sets. Closure properties of regular sets (proofs not required). [1L] Grammar Formalism: Regular grammars-right linear and left linear	8

	9grammars. [1L] Equivalence between regular linear grammar and FA. [1L]Inter conversion, Context free grammar. [1L] Derivation trees, sentential forms. Right most and leftmost derivationof strings. (Concept only) [1L]	
3.	Context Free Grammars, Ambiguity in context free grammars. [1L] Minimization of Context Free Grammars. [1L] Chomsky normal form and Greibach normal form. [1L] Pumping Lemma for Context Free Languages. [1L] Enumeration of properties of CFL (proofs omitted). Closure propertyof CFL, Ogden's lemma & its applications [1L] Push Down Automata: Push down automata, definition. [1L] Acceptance of CFL, Acceptance by final state and acceptance by empty state and its equivalence. [1L] Equivalence of CFL and PDA, interconversion. (Proofs not required).[1L] Introduction to DCFL and DPDA. [1L]	9
4.	Turing Machine : Turing Machine, definition, model [1L] Design of TM, Computable functions [1L] Church's hypothesis, counter machine [1L] Types of Turing machines (proofs not required) [1 L] Universal Turing Machine, Halting problem [2L]	5

Text book and Reference books:

1. "Introduction to Automata Theory Language and Computation", Hopcroft H.E. and Ullman J. D., Pearson education.
2. "Theory of Computation", R.B Patel, Khanna Publishing House, New Delhi
3. "Theory of Computer Science ", Automata Languages and computation", Mishra and Chandra shekaran, 2nd edition, PHI.
4. "Formal Languages and Automata Theory", C.K.Nagpal, Oxford
5. "Switching & Finite Automata", ZVI Kohavi, 2nd Edn., Tata McGraw Hill
6. "Introduction to Computer Theory", Daniel I.A. Cohen, John Wiley
7. "Introduction to languages and the Theory of Computation", John C Martin, TMH
8. "Elements of Theory of Computation", Lewis H.P. & Papadimitrou C.H. Pearson, PHI.

Advanced Computer Architecture
Code: PEC-DS 501C
Contacts: 3L

Name of the Course:	**Advanced Computer Architecture**	
Course Code: PEC-DS501C	Semester: V	
Duration: 6 months	Maximum Marks:100	
Teaching Scheme		**Examination Scheme**
Theory:3 hrs./week		Mid Semester exam: 15
Tutorial: NIL		Assignment and Quiz: 10 marks
		Attendance : 5 marks
Practical: NIL		End Semester Exam :70 Marks
Credit Points:	3	

Unit	Content	Hrs/U nit
1	Computer Architecture and Organization-Review, Fundamentals of Computer Design, Technology Trends Cost Performance Analysis (3L) Parallel Processing Architectures- Taxonomy- SISD, MISD, SIMD,MIMD, PRAM models (3L)	6
2.	Data and Resource Dependencies, Program Partitioning and Scheduling, Control Flow vs. Data Flow (3L) Network topologies-Static, Dynamic, Types of Networks (3L) RISC vs. CISC, Memory Hierarchy, Virtual Memory (4L)	10
3	Concepts of Pipelining, Instruction Pipelining, dynamic pipelining, arithmetic pipelines. (4L) Multiprocessors- Multistage Networks, Cache Coherence, Synchronization, Message- passing (4L) Vector Processing Principles- Instruction types, Compound, Vector Loops, Chaining (4L)	12
4	Array Processors- Structure, Algorithms (3L) Data Flow Architecture- Graphs. Petri Nets, Static and Dynamic DFA, VLSI Computations (4L) Parallel Programming Models, Languages, Compilers (4L)	11

Text book and Reference books:

1. Computer Architecture and Parallel Processing- Kai Hwang and A. .Brigggs International Edition, McGraw Hill
2. Advanced Computer Architecture: D. Sima, T. fountain, P. Kacsuk, Pearson
3. Parallel Computer Architecture: D. Culler, J.P.Singh, A.Gupta, Elsevier
4. Advanced Computer Organization and Architecture, Ikvinderpal Singh, Khanna Publishing House.

Mobile Computing
Code: PEC-DS501B
Contacts: 3L

Name of the Course:	**Mobile Computing**
Course Code: PEC-DS501B	Semester: V
Duration: 6 months	Maximum Marks: 100

Teaching Scheme	**Examination Scheme**
Theory:3 hrs./week	Mid Semester exam: 15
Tutorial: 3L	Assignment and Quiz: 10 marks
	Attendance: 5 marks
Practical: NIL	End Semester Exam: 70 Marks
Credit Points: 3	

Unit	Content	Hrs/Unit
1	Introduction to Personal Communications Services (PCS): PCS Architecture, Mobility management, Networks signalling. Global System for Mobile Communication (GSM) system overview: GSM Architecture, Mobility management, Networksignalling.	5
2	General Packet Radio Services (GPRS): GPRS Architecture, GPRS Network Nodes. Mobile Data Communication: WLANs (Wireless LANs) IEEE 802.11 standard, Mobile IP.	5
3	Wireless Application Protocol (WAP): The Mobile Internet standard, WAP Gateway and Protocols, wireless mark up Languages (WML). Wireless Local Loop(WLL): Introduction to WLL Architecture,wireless Local Loop Technologies.	7
4.	Third Generation (3G) Mobile Services: Introduction to International Mobile Telecommunications 2000 (IMT 2000) vision, Wideband Code Division Multiple Access (W-CDMA), and CDMA 2000, Quality of services in3G	7
5	Global Mobile Satellite Systems; case studies of the IRIDIUM and GLOBALSTAR systems. WirelessEnterprise Networks: Introduction to Virtual Networks, Blue tooth technology, Blue tooth Protocols.	7
6	Server-side programming in Java, Pervasive web application architecture, Device independent exampleapplication	8

Text book and Reference books:

1. "Pervasive Computing", Burkhardt, Pearson
2. "Mobile Communication", J. Schiller, Pearson
3. "Wireless and Mobile Networks Architectures", Yi-Bing Lin & Imrich Chlamtac, John Wiley & Sons, 2001
4. "Mobile and Personal Communication systems and services", Raj Pandya, Prentice Hall of India, 2001.
5. "Guide to Designing and Implementing wireless LANs", Mark Ciampa, Thomson learning, Vikas Publishing House, 2001.
6. "Wireless Web Development", Ray Rischpater, Springer Publishing,
7. "The Wireless Application Protocol", Sandeep Singhal, Pearson .

8. "Third Generation Mobile Telecommunication systems", by P.Stavronlakis, Springer Publishers,
9. Brijesh Gupta "Mobile Computing", Khanna Publishing House, New Delhi

Computer Graphics
Code: PEC-DS501D
Contacts: 3L

Name of the Course:	**Computer Graphics**	
Course Code: PEC-DS501D	Semester: V	
Duration: 6 months	Maximum Marks:100	
Teaching Scheme		**Examination Scheme**
Theory:3 hrs./week		Mid Semester exam: 15
Tutorial: NIL		Assignment and Quiz: 10 marks
		Attendance : 5 marks
Practical: NIL		End Semester Exam :70 Marks
Credit Points:	3	

Unit	Content	Hrs/U nit
1	**Introduction to computer graphics & graphics systems [6L**]: Overview of computer graphics, representing pictures, preparing, presenting & interacting with picturesfor presentations; Visualization & image processing; RGB color model, direct coding, lookup table; storage tube graphics display, Raster scan display, 3D viewing devices, Plotters, printers, digitizers, Light pens etc.; Active & Passive graphics devices; Computer graphics software. **Scan conversion [8L]:** Points & lines, Line drawing algorithms; DDA algorithm, Bresenham's line algorithm, Circle generation algorithm; Ellipse generating algorithm; scan line polygon, fill algorithm, boundary fill algorithm, flood fill algorithm.	14
2	**2D transformation & viewing [15L]:** Basic transformations: translation, rotation, scaling; Matrix representations & homogeneous coordinates, transformations between coordinate systems; reflection shear; Transformation of points, lines, parallel lines, intersecting lines. Viewing pipeline, Window to view port co-ordinate transformation, clipping operations, point clipping, line clipping, clipping circles, polygons & ellipse. Cohen and Sutherland line clipping, Sutherland-Hodgeman Polygon clipping, Cyrus-beck clipping method3D transformation & viewing [5L]: 3D transformations: translation, rotation, scaling & other transformations. Rotation about an arbitrary axis in space, reflection through an arbitrary plane; general parallel projection transformation; clipping, view port clipping, 3D viewing.	20
	Curves [3L]: Curve representation, surfaces, designs, Bezier curves,	

3.	B-spline curves, end conditions for periodic B-spline curves, rational B-spline curves. **Hidden surfaces [3L]:** Depth comparison, Z-buffer algorithm, Backface detection, BSP tree method, the Painter's algorithm, scan-line algorithm; Hidden line elimination, wire frame methods , fractal - geometry. **Color & shading models [2L]:** Light & color model; interpolative shading model; Texture. **Introduction to Ray-tracing: [3L]** Human vision and color, Lighting, Reflection and transmission models.	6

Text book and Reference books:

1. Hearn, Baker – "Computer Graphics (C version 2nd Ed.)" – Pearson education
2. Z. Xiang, R. Plastock – " Schaum's outlines Computer Graphics (2nd Ed.)" – TMH
3. D. F. Rogers, J. A. Adams – "Mathematical Elements for Computer Graphics (2nd Ed.)" – TMH

Compiler Design
Code: PEC- DS 501E
Contact: 3L

Name of the Course:	**Compiler Design**	
Course Code: PEC-DS501E	Semester: V	
Duration:6 months	Maximum Marks:100	
Teaching Scheme		**Examination Scheme**
Theory:3 hrs./week		Mid Semester exam: 15
Tutorial: NIL		Assignment and Quiz: 10 marks
		Attendance: 5 marks
Practical: NIL		End Semester Exam:70 Marks
Credit Points:	3	

Unit	Content	Hrs/Unit
1	**Introduction to Compiling** [3L] Compilers, Analysis of the source program, The phases of the compiler, Cousins of the compiler.	3
2	**Lexical Analysis** [6L] The role of the lexical analyzer, Tokens, Patterns, Lexemes, Input buffering, Specifications of a token, Recognition of a tokens, Finite automata, From a regular expressionto an NFA, From a regular expression to NFA, From a regular expression to DFA, Design of a lexical analyzer generator (Lex).	6

3	**Syntax Analysis** [9L] The role of a parser, Context free grammars, Writing a grammar, Top down Parsing, Non- recursive Predictive parsing (LL), Bottom up parsing, Handles, Viable prefixes, Operator precedence parsing, LR parsers (SLR, LALR), Parser generators (YACC). Error Recovery strategies for different parsing techniques.	9
4	**Syntax directed translation** [5L] Syntax director definitions, Construction of syntaxtrees, Bottom-up evaluation of S attributed definitions, L attributed definitions, Bottom-up evaluation of inherited attributes.	5
5	**Type checking** [4L] Type systems, Specification of a simple type checker, Equivalence of type expressions, Typeconversions	4
6	**Run time environments** [5L] Source language issues (Activation trees, Controlstack, scope of declaration, Binding of names), Storage organization (Subdivision of run-time memory, Activation records), Storage allocation strategies, Parameterpassing (call by value, call by reference, copy restore, call by name), Symbol tables, dynamic storage allocation techniques.	5
7	**Intermediate code generation** [4L] Intermediate languages, Graphical representation,Three-address code, Implementation of three address statements (Quadruples, Triples, Indirect triples).	4
8	**Code optimization** [5L] Introduction, Basic blocks & flow graphs, Transformation of basic blocks, Dag representationof basic blocks, The principle sources of optimization, Loops in flowgraph, Peephole optimization.	5
9	**Code generations** [4L] Issues in the design of code generator, a simple code generator, Register allocation & assignment.	4

Text book and Reference books:

1. Aho, Sethi, Ullman - “Compiler Principles, Techniques and Tools” - Pearson Education.
2. Holub - “Compiler Design in C” - PHI.

Constitution of India
Code: MC-CS501A
Contacts: 3L

Name of the Course:	**Constitution of India**	
Course Code: MC-CS501	Semester: V	
Duration: 6 months	Maximum Marks:100	
Teaching Scheme		**Examination Scheme**
Theory:		Mid Semester exam: 15
Tutorial: NIL		Assignment and Quiz: 10 marks
		Attendance : 5 marks
		End Semester Exam:70 Marks
Practical: NIL		
Credit Points:	0	

Unit	Content	Hrs/U nit
1	**Introduction:** Constitution' meaning of the term,, Indian Constitution: Sources and constitutional history, Features: Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy	3
2	**Union Government and its Administration :** Structure of the Indian Union: Federalism, Centre- State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha	6
3.	**State Government and its Administration Governor:** Role and Position, CM and Council of ministers, State Secretariat: Organisation, Structure and Functions	6
4.	**Local Administration District's Administration head:** Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation, Pachayati raj: Introduction, PRI: Zila Pachayat, Elected officials and their roles, CEO Zila Pachayat: Position and role, Block level: Organizational Hierarchy (Different 4.departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy	8
5.	**Election Commission Election Commission:** Role and Functioning, Chief Election Commissioner and Election Commissioners, State Election Commission: Role and Functioning, Institute and Bodies for the welfare of SC/ST/OBC and women	

Text book and Reference books:

1. 'Indian Polity' by Laxmikanth
2. 'Indian Administration' by Subhash Kashyap
3. 'Indian Constitution' by D.D. Basu
4. 'Indian Administration' by Avasti and Avasti

Name of the Course:	**Essence of Indian Knowledge and Tradition**
Course Code: MC-CS 501 B	**Semester: VIII**
Duration: 6 months	**Maximum Marks: 70**
Teaching Scheme	**Examination Scheme**
Theory: 3 hrs./week	Mid Semester Exam.: 15 Marks
Tutorial: Nil	Assignment & Quiz: =10(=8+2) Marks
	Attendance: 5 Marks
Practical: hr./week	End Semester Exam.: 70 Marks
Credit Points: 0	

Objective:	
1	The course aims at imparting basic principles of thought process, reasoning and inferencing. Sustainability is at the core of Indian Traditional Knowledge Systems connecting society andnature.
2	Holistic life style of Yogic-science and wisdom capsules in Sanskrit literature are also important in modern society with rapid technological advancements and societaldisruptions.
3	The course focuses on introduction to Indian Knowledge System, Indian perspective of modern scientific world-view and basic principles of Yoga and holistic health care system.

Pre-Requisite:	
1	No
2	
3	

End Semester Examinations Scheme. Maximum Marks – 70. Time allotted – 3 hrs.

Groups	**Units**	**Objective Questions (MCQ only with one correct answer)**		**Subjective Questions**			
		No. of questions to be set	**Total marks**	**No. of questions to be set**	**To answer`**	**Marks per question**	**Total marks**
A	**1 to 4**	**10**	**10**				
B	**1 to 4**			**6**	**3**	**5**	**15**
C	**1 to 4**			**6**	**3**	**15**	**45**

- **Only multiple choice type questions (MCQ) with one correct answer are to be set in the objective part.**
- **Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.**

Unit	Content	Hrs/Unit	Marks/Unit
1	Basic Structure of Indian Knowledge System (i) Veda (ii) Upa-Veda (iii) Vedanga (iv) Upanga		

2	Modern Science and Indian Knowledge System		
3	Yoga and Holistic Health care		
4	Case Studies		
	Total		

Text and reference books:

1. Sivaramakrishna V. (Ed.), Cultural Heritage of India- Course Material, 5th Edition, Bharatiya Vidya Bhavan, Mumbai,2014.
2. Jitatmanand S., Modern Physics and Vedant, Bharatiya VidyaBhavan.
3. Capra F., Tao ofPhysics.
4. Capra F., The wave ofLife.
5. Jha V.N., Tarkasangraha of Annam Bhatta (Eng. Trans), International Chinmay Foundation, Velliarnad,Amaku.
6. Yoga Sutra of Patanjali, Ramakrishna Mission,Kolkata.
7. Jha G.N. and Jha R.N. (Ed.), Yoga-Darshanam with Vyasa Bhashya (Eng. Trans.), Vidyanidhi Prakasham, Delhi,2016.
8. Jha R.N., Science of Consciousness Psychotherapy and Yoga Practices, Vidyanidhi Prakasham, Delhi,2016.
9. Sharma P.R., Shodashang Hridayam (Englishtranslation).

Course Outcome:

After successful completion of this course, the students should be able to

1. To understand, connect up and explain basics of Indian Traditional knowledgemodern scientific perspective.

Software Engineering Lab
Code: ESC591
Contact: 4P

Name of the Course:	**Software Engineering Lab**
Course Code: **ESC591**	Semester: V
Duration:6 months	Maximum Marks:100
Teaching Scheme:	
Theory: hrs./week	Continuous Internal Assessment
Tutorial: NIL	External Assesement:60
Practical: 4 hrs./week	Distribution of marks:40
Credit Points:	2

Laboratory Experiments:

- Problem Analysis and Project Planning -Thorough study of the problem – Identify Project scope, Objectives and Infrastructure.
- Software Requirement Analysis – Describe the individual Phases/modules of the project and Identify deliverables. Identify functional and non-functional requirements.
- Data Modeling – Use work products – data dictionary.
- Software Designing - Develop use case diagrams and activity diagrams, build and test class diagrams, sequence diagrams and add interface to class diagrams.
- Prototype model – Develop the prototype of the product.

The SRS and prototype model should be submitted for end semester examination.

Any experiment specially designed by the college
(Detailed instructions for Laboratory Manual to be followed for further guidance)

Operating SystemLab
Code: PCC- CS592
Contacts: 4P

Name of the Course:	Operating System Lab
Course Code: PCC-CS592	Semester: V
Duration:6 months	Maximum Marks:100
Teaching Scheme:	
Theory: hrs./week	Continuous Internal Assessment
Tutorial: NIL	External Assesement:60
Practical: 4 hrs./week	Distribution of marks:40
Credit Points:	2

1 1. **Managing Unix/Linux Operating System [8P]:**
Creating a bash shell script, making a script executable, shell syntax (variables, conditions, control structures, functions,

commands). Partitions, Swap space, Device files, Raw and Block files, Formatting disks, Making file systems, Superblock, I-nodes, File system checker, Mounting file systems, Logical Volumes, Network File systems, Backup schedules and
methods Kernel loading, init and the inittab file, Run-levels, Run level scripts. Password file management, Password
security, Shadow file, Groups and the group file, Shells, restricted shells, user-management commands, homes and
permissions, default files, profiles, locking accounts, setting passwords, Switching user, Switching group, Removing users &user groups.
2. **Process [4P]**: starting new process, replacing a process image, duplicating aprocess image, waiting for a process,
zombie process.
3. **Signal [4P]**: signal handling, sending signals, signal interface, signal sets.
4. **Semaphore [6P]**: programming with semaphores (use functions semctl, semget, semop, set_semvalue, del_semvalue, semaphore_p, semaphore_v).
5. **POSIX Threads [6P]**: programming with pthread functions (viz. pthread_create, pthread_join, pthread_exit,
pthread_attr_init, pthread_cancel)
6. **Inter-process communication [6P]**: pipes(use functions pipe, popen, pclose), named pipes(FIFOs, accessing FIFO),
message passing & shared memory(IPC version V).

Any experiment specially designed by the college
(Detailed instructions for Laboratory Manual to be followed for further guidance)

Object Oriented Programming Lab
Code: PCC-CS593
Contacts: 4P

Name of the Course:	Object Oriented Programming Lab
Course Code: PCC-CS593	Semester: V
Duration:6 months	Maximum Marks:100
Teaching Scheme:	
Theory: hrs./week	Continuous Internal Assessment
Tutorial: NIL	External Assesement:60
Practical: 4 hrs./week	Distribution of marks:40
Credit Points:	2

Laboratory Experiments:
1. Assignments on class, constructor, overloading, inheritance, overriding 2. Assignments on wrapper class, arrays 3. Assignments on developing interfaces- multiple inheritance, extending interfaces 4. Assignments on creating and accessing packages
5. Assignments on multithreaded programming 6. Assignments on applet programming **Note: Use Java for programming**

Any experiment specially designed by the college
(Detailed instructions for Laboratory Manual to be followed for further guidance)