Haldia Institute of Technology

Department of Information Technology

Course Outcomes (CO's)

B-Tech, 2nd Year 3rd Semester

Course Name: Analog & Digital Electronics **Code:** ESC IT 301	
ESC IT301.1	**Define** the fundamental Analog circuits such as Amplifiers, Wein Bridge Oscillator, Multivibrators, Schimtt Trigger, and 555 timers.
ESC IT301.2	**Distinguish** between analog and digital system with the basic about binary number system and Boolean algebra.
ESC IT301.3	**Demonstrates** the fundamental combinational and sequential logic circuits; and counters and registers.
ESC IT301.4	**Discuss** the basic concepts of logic families and realize the basic A/D and D/A conversion techniques.
ESC IT301.5	**Formulate** the combinational and sequential circuit design and minimization techniques.
ESC IT301.6	**Validate** the circuit design theory for model development of logic circuits.

Course Name: Data Structure & Algorithms **Code:** PCC IT301	
PCC IT301.1	**Describe** various data structure and physical storage structure in computer memory
PCC IT301.2	**Explain** the concept of recursion, recursion algorithms and the use of linear data structure in recursion problems.
PCC IT301.3	**Relate** various data structures like stack, queue, linked list etc. and use them to solve problems.
PCC IT301.4	**Differentiate** different tree data structures like binary tree, binary search tree, AVL tree etc. and use them to solve problems.
PCC IT301.5	**Design** algorithm for sorting and formulate their complexity.
PCC IT301.6	**Conclude** with several graph data structure like DFS, BFS, etc. and use them to solve problems.

Course Name: Object Oriented Programming **Code:** PCC IT302	
PCC IT302.1	**Understand** the principles and practice of object oriented analysis and design in the construction of robust, maintainable programs which satisfy their requirements.
PCC IT302.2	**Identify** classes, objects, members of a class and the relationships among them needed for a specific problem.
PCC IT302.3	**Acquire** the concept of OOP as well as the purpose and usage principles of inheritance, polymorphism, encapsulation and method overloading.
PCC IT302.4	**Implement**, compile, test and run Java programs comprising more than one class, to address a particular software problem to a given set of requirements
PCC IT302.5	**Create** Java application programs using sound OOP practices (e.g., interfaces and APIs) and proper program structuring (e.g., by using access control identifies, exception handling, package, Java standard class library)
PCC IT302.6	**Develop** java programs using the Java AWT and Java I/O as well as the Java standard class library to meet the customer's requirements and sustainable development with effective project management.

Course Name: Mathematics-III (Probability & Statistics) **Code:** BSC IT301	
BSC IT301.1	**Recite** concept of permutation and combination, concept of statistics.
BSC IT301.2	**Discuss** the concept probability distribution, statistical inference and hypothesis testing.
BSC IT301.3	**Demonstrate** computational modelling of biological phenomena and applies techniques from areas such as artificial intelligence, data base, software engineering, machine learning, image processing.
BSC IT301.4	**Illustrate** physical scenario and classify them to recognize the best fit physical and logical models.
BSC IT301.5	**Compare** different mathematical results during the process of problem analysis.
BSC IT301.6	**Design** models to demonstrate industrial problem for emerging trend in information technology.

Course Name: Economics for Engineers (Humanities-II) **Code:** HSMC IT 301	
HSMC IT301.1	Encounter different problem issues in engineering related to system design, system deployment, project management, etc. and approach towards optimal solution.
HSMC IT	Prepare estimation for short term targets in an industry and compare the

301.2	actual costs incurred for the same to determine the efficiency of the system.
HSMC IT301.3	Prepare estimation of supply, installation and commissioning in live projects and take necessary measures of cost control.
HSMC IT301.4	Take long term investment decision; select the most profitable project, take decision related to replacement of assets.
HSMC IT301.5	Identify the assets that are subject to depreciation, maintain depreciation account to access the benefit as per tax regulations
HSMC IT301.6	Can prepare and analyze the financial statements of the company, and determine its financial health

Course Name: Environmental Sciences **Code:** MC IT 301	
MC IT301.1	Articulate the interconnected and interdisciplinary nature of environmental studies
MC IT301.2	Demonstrate an integrative approach to environmental issues with a focus on sustainability
MC IT301.3	Use critical thinking, problem-solving, and the methodological approaches in environmental problem solving
MC IT301.4	Communicate complex environmental information to both technical and non-technical audiences.
MC IT301.5	Understand and evaluate the global scale of environmental problems.
MC IT301.6	Reflect critically on their roles, responsibilities, and identities as citizens, consumersand environmental actors in a complex, interconnected world.

Course Name: Analog & Digital Electronics Lab **Code:** ESC IT391	
ESC IT391.1	Acquired knowledge about basics of digital electronics
ESC IT391.2	Explain about how to solve problems related to number systems and Boolean algebra.
ESC IT391.3	Ability to identify, analyze and design combinational circuits.
ESC IT391.4	Design and implement code conversion circuit.
ESC IT391.5	Compare various synchronous and asynchronous sequential circuits
ESC IT391.6	Able to analyze sequential digital circuits like flip-flops, registers, counters.

Course Name: Data Structure & Algorithm Lab **Code:** PCC IT 391	
PCC IT391.1	Implement appropriate data structure for simple algorithms including Stack and Queue.
PCC IT391.2	Design and implement the both array based and linked-list based data structures, including singly, doubly, and circular linked-lists.
PCC IT391.3	Design general tree data structures, including binary tree, both array based and linked list.
PCC IT391.4	Create and implement algorithms for advance tree such as binary search tree, AVL tree etc.
PCC IT391.5	Programming and complexity analysis for several sorting and searching algorithm.
PCC IT391.6	Create and implement several graph data structures, like BFS and DFS.

Course Name: Object Oriented Programming Lab **Code:** PCC IT 392	
PCC IT392.1	Implement Object Oriented programming concept using basic syntaxes of controls Structures, strings and function for developing skills of logic building activity.
PCC IT392.2	Identify classes, objects, members of a class and the relationships among them needed for a finding the solution to specific problem.
PCC IT392.3	Demonstrates how to achieve reusability using inheritance, interfaces and packages and describes faster application development can be achieved.
PCC IT392.4	Demonstrate understanding and use of different exception handling mechanisms and concept of multithreading for robust faster and efficient application development.
PCC IT392.5	Identify and describe common abstract user interface components to design GUI in Java using Applet & AWT along with response to events.
PCC IT392.6	Identify, Design & develop a Graphical user interfaces using principal of Java and JDBC.

B-Tech, 2nd Year 4th Semester

Course Name: Discrete Mathematics	**Code:** PCC IT 401
PCC IT 401.1	**Express** a logic sentence in terms of predicates, quantifiers, and logical connectives. Upon completion of the course, the student will be able to use logical notation.
PCC IT 401.2	**Derive** the solution for a given problem using deductive logic and prove the solution based on logical inference. Apply recursive functions and solve recurrence relations.

PCC IT 401.3	**Classify** its algebraic structure for a given a mathematical problem. Describe useful standard library functions, create functions, and declare parameters.
PCC IT 401.4	**Evaluate** Boolean functions and simplify expressions using the properties of Boolean algebra. Design and evaluate Euler and Hamilton circuits. Able to apply algorithms to problems including searching algorithms, base conversion algorithms and the Euclidean algorithm.
PCC IT 401.5	**Develop** the given problem as graph networks and solve with techniques of graph theory. And calculate discrete probabilities. Students will be able to apply Recursion and advanced counting technique problem solution.
PCC IT 401.6	**Apply** basic and advanced principles of counting. Simplify and evaluate basic logic statements including compound statements, implications, Inverses, converses, and contra-positives using truth tables and the properties of logic.

Course Name: Computer Organization & Architecture	**Code:** PCC IT 402
PCC IT402.1	**Describe and explain** the difference between computer organization and computer architecture.
PCC IT402.2	**Design** the ALU for different arithmetical and logical problems and apply the knowledge of different multiplication and division algorithm.
PCC IT402.3	**Formulate** design methodology for using various types of instructions.
PCC IT402.4	**Differentiate** between different Memory hierarchy (Primary, Secondary, Cache). Able to solve different kind of numerical based on memory technologies and page replacement techniques.
PCC IT402.5	**Differentiate** between types of pipeline, hazards and selecting remedial techniques to handle the hazards. able to distinguish between parallel architectures. Compare performance parameters of pipelines and deduce derivations to demonstrate change in performance parameters when branching is introduced. Able to solve numerical based on pipeline concepts.
PCC IT402.6	**Comparing** techniques of ILP, types of CU, types of shared memory architectures. Distinguish between different multiprocessor architectures, Data Flow architecture, RISC and CISC architecture.

Course Name: Formal Language & Automata Theory	**Code:** PCC IT403
PCC IT403.1	**Define** the mathematical principles behind theoretical computer science
PCC IT403.2	**Differentiate** and construct different types of automata like finite automata, push down automata, linear bounded automata and Turing machine.

PCC IT403.3	**Obtain** minimized DFA and conversion of automata to regular expressions and regular expression to automata and proving languages are not regular using pumping lemma.
PCC IT403.4	**Explain** CFG's, construction of parse trees, demonstrate ambiguity in grammars, designing problems on Pushdown Automata.
PCC IT403.5	**Evaluate** conversion of grammar to CNF ,GNF, conversion of grammar to PDA and proving that languages are not context free using pumping lemma.
PCC IT403.6	**Designing** Turing machines, understanding the working of various types of Turing machines and solving post correspondence problems.

Course Name: Design and Analysis of Algorithms **Code:** PCC IT404	
PCC IT404.1	**Understand** the running time and space complexity of algorithms.
PCC IT404.2	**Describe** the concept of big Oh, Omega and Theta notations to compute the time complexity.
PCC IT404.3	**Analyse** the efficiency and correctness of an algorithm.
PCC IT404.4	**Apply** the mathematical techniques required for computing the time complexity of a program/algorithm.
PCC IT404.5	**Implement** major algorithm paradigms (such as divide and conquer, greedy method, dynamic programming, local search, backtracking, and approximation algorithms) to a variety of real-world problems to design a good algorithm.
PCC IT404.6	**Formulate** the notions of P, NP, NP-complete, and NP-hard and to compare and differentiate with deterministic algorithms

Course Name: Numerical Methods **Code:** PCC IT405	
PCC IT405.1	**Remembering:** Recalling the basic mathematical tools such as, derivative, real integration, solution of equations, existence of solution of system of linear equations and differential equation.
PCC IT405.2	**Understanding:** Describe the concept of error, operators and interpolation. Numerical approach of solving missing term, finding of polynomials, integrated value, solution of algebraic equations, system of linear equations and differential equation.
PCC IT405.3	**Applying:** Use interpolation, integration for data analysis and finding of volume of rough surface. Apply different numerical techniques to solve algebraic equations, system of linear equations in iterative way. Solve boundary value wave and heat equations using differential equations.

PCC IT405.4	**Analyzing:** Analyze different real time problems and categorize them during the process of solving, by numerical technique mentioned.
PCC IT405.5	**Evaluating:** Justify and make gradation of above mentioned numerical tools and determine the right approach to find the optimal solution for multidisciplinary engineering problems.
PCC IT405.6	**Creating:** Design a working model and build a path by which a new approach can be generated to create a new problem appreciated by academics, research & emerging direction in industry.

Course Name: Biology **Code:** BSC IT 401	
BSC IT401.1	To understand the basic principles of biology and its relationship with engineering sciences to recognize and state substantiated solution.
BSC IT401.2	To learn the classification system of organisms with respect to different criteria and their position and importance in the ecosystem.
BSC IT401.3	To apply appropriate principles of genetics to analyze and understand inheritance associated problems with an understanding of the limitation.
BSC IT401.4	To acquire basic idea about different bio-molecules, their importance and their actions in the living world.
BSC IT401.5	Design and develop processes based on basic thermodynamics principles and solve problems within realistic constraints such as economic, environmental, ethical, health, feasibility, and sustainability.
BSC IT401.6	To know basic microbial procedures that is followed in order to understand the basic safety and hygiene to serve the society at large and incorporate the knowledge in the light of lifelong learning.

Course Name: Computer Organization & Architecture Lab **Code:** PCC IT492	
PCC IT492.1	To apply concepts and methods of digital system design techniques through hands-on projects.
PCC IT492.2	To analyze the results of logic and timing simulations and to use these simulation results to debug digital systems.
PCC IT492.3	To learn to design combinational and sequential digital systems starting from a word description that performs a set of specified tasks and functions.
PCC IT492.4	To develop skills, techniques and learn state-of-the art engineering tools (such as VHDL, Xilinx ISE simulator etc) to design, implement and test modern day digital systems on FPGAs.
PCC IT492.5	To learn by using Xilinx Foundation tools and Hardware Description Language (VHDL).
PCC IT492.6	To learn through hands-on experimentation the Xilinx tools for FPGA design as well as the basics of VHDL design and simulate digital systems.

Course Name: Design & Analysis of Algorithm Lab **Code:** PCC IT494	
PCC IT494.1	To analyze the complexities of various problems in different domains and to prove the correctness and analyze the running time of the basic algorithms for those classic problems in various domains.
PCC IT494.2	To understand methods for analyzing the efficiency and correctness of algorithms (such as exchange arguments, recurrence, induction, and complexity analysis)

PCC IT494.3	To design algorithms using the divide and conquer, dynamic programming, greedy method, Backtracking algorithms, etc that employ this strategy.
PCC IT494.4	To compare, contrast, and choose appropriate algorithmic design techniques to present an algorithm that solves a given problem.
PCC IT494.5	To develop the efficient algorithms for the new problem with suitable designing techniques.
PCC IT494.6	To know the appropriate algorithmic design technique to specific problems.

Course Name: IT Workshop Lab **Code:** PCC IT495	
PCC IT495.1	Understand principles of Python.
PCC IT495.2	Understand the pros and cons on scripting languages vs. classical programming languages (at a high level)
PCC IT495.3	To master an understanding of scripting & the contributions of scripting languages
PCC IT495.4	Design real life problems and think creatively about solutions
PCC IT495.5	Apply a solution in a program using R/Matlab/Python.
PCC IT495.6	To be exposed to advanced applications of mathematics, engineering and natural sciences to program real life problems.

B-Tech, 3rd Year 5th Semester

Course Name: Software Engineering **Code:** ESC IT501	
ESC IT501.1	Identify an effective software engineering process, based on knowledge of widely used development lifecycle models.
ESC IT501.2	Define the basic concepts and importance of Software project management concepts like cost estimation, scheduling and reviewing the progress, identification and implementation of the software metrics.
ESC IT501.3	Work effectively alone or in a team to analyze the requirements of a complex software system, and solve problems by creating appropriate designs that satisfies these requirements.
ESC IT501.4	Capture, document and analyze requirements and translate a requirements specification into an implementable design, following a function-oriented or object-oriented approach.
ESC IT501.5	Formulate a testing strategy for a software system, employing techniques such as unit testing, test driven development and functional testing.
ESC IT501.6	Analyze software risks and risk management strategies and defining the concepts of software quality and reliability on the basis of International quality standards.

Course Name: Database Management System	**Code:** PCC IT501
PCC IT501.1	Define a Problem at the view level & ability to Understand the physical structure of the database to handle data.
PCC IT501.2	Implement the logic by using tools like ERD.
PCC IT501.3	Formulate using relational algebra, Solutions to a broad range of query and data update problems.
PCC IT501.4	Formulate SQL query with data.
PCC IT501.5	Understand the Knowledge of functional dependencies to Design and Normalize the database & Analyze the internal data structure.
PCC IT501.6	Understand the Knowledge of transaction system & could extract data efficiently.

Course Name: Operating System	**Code:** PCC IT502
PCC IT502.1	**Describes** the general architecture along with different structures of computers and operating system.
PCC IT502.2	**Explain** the process management policies; predicts the requirement for process synchronization and coordination handled by operating system.
PCC IT502.3	**Demonstrates** and computes Scheduling algorithms and formulate solutions for critical section problem.
PCC IT502.4	**Compute** system model for deadlock, Methods for handling deadlocks and Describe; analyze the memory management and its allocation policies.
PCC IT502.5	**Design** File, directory and Constructs various Access methods and implementation
PCC IT502.6	**Justifies** the tradeoffs in design and implementation concepts used in the development of various Operating Systems.

Course Name: Introduction to Industrial Management (Humanities III) **Code:** HSMC IT 501	
HSMC IT501.1	Define and understand the concept of management, organizational culture and moral factors associated with it.
HSMC IT501.2	Describe the different aspects of critical path methods, material management and be able to apply them in real-time.
HSMC IT501.3	Analyze the production planning and control.
HSMC IT 501.4	Assess the value analysis (VA) process and survey the different cost control measures.
HSMC IT501.5	Evaluate the Enterprise Resource Planning (ERP) and Just in Time (JIT) features and their applications.
HSMC IT501.6	Develop fundamental knowledge of Industrial management to implement in real-time and supplement the lifelong learning

Course Name: Compiler Design	**Code:** PEC IT 501A
PEC IT 501A.1	Describe the different phases of compiler and identify different possible errors detected by different phases.
PEC IT 501A.2	Explain the mean of token and distinguish between the NFA and DFA. Recommend a DFA to recognize partial keywords of programming language.
PEC IT 501A.3	Demonstrate the role of a parser. Understand the top-down and bottom-up parsing techniques and its design issues.
PEC IT 501A.4	Differentiate the role of semantic analysis phase to syntax analysis phase. Be aware of how data type issues are handled in semantic analysis phase.
PEC IT 501A.5	Constructs the significance of intermediate code generation phase. Revise the different ways of intermediate code generation techniques and run-time environment issues in compilation
PEC IT 501A.6	Discriminates the knowledge of code optimization and code generation issues. Make DAG representation of basic blocks and flow graphs.

Course Name: Artificial Intelligence	**Code:** PEC IT 501B
PEC IT 501B.1	Describe the fundamental concepts of AI.
PEC IT 501B.2	Illustrate basic search techniques with examples.
PEC IT 501B.3	Solve crypt-arithmetic problems.
PEC IT 501B.4	Illustrate mini-max algorithm and alpha-beta pruning. Apply resolution and resolution refutation techniques in propositional and predicate logic.
PEC IT 501B.5	Represent knowledge using semantic network, extended semantic network and frames.
PEC IT 501B.6	Explain the concepts of expert systems and its applications

Course Name: Computer Graphics	**Code:** PEC IT501C
PEC IT501C.1	Describe computer graphics system, display devices and various application areas of graphics.
PEC IT501C.2	Explain Scan Conversion algorithms for line, circle and ellipse with examples
PEC IT501C.3	Demonstrate 2D and 3D transformation operations such as translation, rotation, scaling, etc.
PEC IT501C.4	Analyze and model any kind of 3D objects using viewing, clipping and projection techniques.
PEC IT501C.5	Apply various curve and surface representation methods such as B-Spline, Bezier, etc.
PEC IT501C.6	Comparing various hidden surface removal algorithms, and lighting and shading models.

Course Name: Software Engineering Lab	**Code:** ESC IT591
ESC IT591.1	Design requirement document for proposed project in standard format.
ESC IT591.2	Design project Schedule using tools like MS Project.
ESC IT591.3	Design diagrams of Gnatt and PERT chart from schedule & prepare Project Management Plan in standard format
ESC IT591.4	Deploy Structural Modeling, Behavioral Modeling, and Architectural Modeling and design Software Design Document using tools like Rational Rose.
ESC IT591.5	Evaluate project size using Function Point(FP) on Excel Office template
ESC IT591.6	Perform defect root cause analysis using Fishbone diagram

Course Name: Data Base Management System Lab	**Code:** PCC IT591
PCC IT591.1	Understand through laboratory activities to solve problems related to key concepts taught in the classroom.
PCC IT591.2	Create and populate a RDBMS, using SQL.
PCC IT591.3	Write queries in SQL to retrieve any type of information from a data base.
PCC IT591.4	Design conceptual models of a database using ER modeling for real life applications and also construct queries in Relational Algebra.
PCC IT591.5	Create and maintain tables using PL/SQL
PCC IT591.6	Construct problem definition statements for real life applications and implement a database for the same.

Course Name: Operating System Lab	**Code:** PCC IT592
PCC IT592.1	Describes the concept of Unix and Linux operating system and its associate's commands.
PCC IT592.2	Explains the accessibility of files, create and change the permissions associated with files and several other tasks.
PCC IT592.3	Develop and demonstrate shell script programming for several problems.
PCC IT592.4	Design the programs of process creation, replacing or duplicating a process image.
PCC IT592.5	Understand and constructs the concept mutual exclusion in semaphore in modern operating system.
PCC IT592.6	Construct the program for inter process communication

B-Tech, 3rd Year 6th Semester

Course Name: Computer Networks	**Code:** PCC IT601
PCC IT601.1	Describes the utility of layered architecture with OSI and TCP/IP models and identify the responsibility of each layer.
PCC IT601.2	Explain different data link layer utilities, functions, control and protocols and Describe with their uses and applications.
PCC IT601.3	Demonstrate network layer routing algorithms and Classify the congestion control algorithms. Implementation of the routing protocols is

	also taken care.
PCC IT601.4	Relates the Session layer design issues and Transport layer services.
PCC IT601.5	Estimates the functions of Application layer and Presentation layer paradigms and Protocols.
PCC IT601.6	Justifies network security, cryptography, data integrity working concept.

Course Name: Advanced Java & Web Technology **Code:** PCC IT602	
PCC IT602.1	Understand the JSP and Servlet concepts.
PCC IT602.2	Apply JDBC and ODBC technologies to create database connectivity
PCC IT602.3	Develop reusable component for Graphical User Interface applications.
PCC IT602.4	Apply the concepts of server side technologies for dynamic web applications.
PCC IT602.5	Implement the web based applications using effective data base access with rich client interaction.
PCC IT602.6	Implement web based applications using features of HTML and XML RISC and CISC architecture

Course Name: Multimedia Technology **Code:** PCC IT603	
PCC IT603.1	Identify and understand the technical aspect of multimedia systems including digitization.
PCC IT603.2	Understand the principles for different media like image, audio, video and text applications.
PCC IT603.3	Learn about multimedia database system, segmentation, indexing and animation.
PCC IT603.4	Be familiar with the concept about various compression techniques for both textual and non-textual information.
PCC IT603.5	Develop multimedia application and analyze the performance of the same. To gain hands-on experience in image, sound and video editing and in some aspects of multimedia authoring (incorporating images, sound, video, and animation).
PCC IT603.6	Justify various compression techniques and develop different multimedia systems applicable in real time.

Course Name: Machine Learning **Code:** PCC IT604	
PCC IT604.1	Recognize the characteristics of Machine Learning techniques that enable to solve real world problems
PCC IT604.2	Recognize the characteristics of machine learning strategies
PCC IT604.3	Apply various supervised learning methods to appropriate problems
PCC IT604.4	Identify and integrate more than one techniques to enhance the performance of learning
PCC IT604.5	Create probabilistic and unsupervised learning models for handling unknown pattern

PCC IT604.6	Analyze the co-occurrence of data to find interesting frequent patterns

Course Name: Distributed Database Systems	**Code:** PEC IT601A
PEC IT601A.1	To understand distributed database design.
PEC IT601A.2	To recognize query processing in a distributed database system.
PEC IT601A.3	To identify some of the problems and solutions of database failures and recoveries.
PEC IT601A.4	To apply concurrency control and database correctness.
PEC IT601A.5	To analyze distributed database limitations and consequences.
PEC IT601A.6	To design distributed database.

Course Name: Data Warehousing and Data Mining	**Code:** PEC IT601B
PEC IT601B.1	Understand warehousing architectures and tools for systematically organizing large database and use their data to make strategic decisions.
PEC IT601B.2	Understand KDD process for finding interesting pattern from warehouse.
PEC IT601B.3	Remove redundancy and incomplete data from the dataset using data preprocessing methods.
PEC IT601B.4	Characterize the kinds of patterns that can be discovered by association rule mining.
PEC IT601B.5	Discover interesting patterns from large amounts of data to analyze for predictions and classification.
PEC IT601B.6	Develop a data mining application for data analysis using various tools.

Course Name: Human Computer Interaction	**Code:** PEC IT601C
PEC IT601C.1	Describe and apply core theories, models and methodologies from the Field of HCI.
PEC IT601C.2	Describe what the user-centered design cycle is and explain how to Practice this approach to design interactive software system.
PEC IT601C.3	Analyze one after another the main features of interactive systems, and explain how to gauge the usability of digital environments, tools and interfaces
PEC IT601C.4	Conduct user and task analysis
PEC IT601C.5	Implement graphical user interfaces with modern software tools
PEC IT601C.6	Critiqueandevaluateinteractivesoftwareusingguidelinesfromhumanfactor theories

Course Name: Pattern Recognition	Code: PEC IT601D
PEC IT601D.1	Explain and compare a variety of pattern classification, structural pattern recognition, and pattern classifier combination techniques.
PEC IT601D.2	Summarize, analyze, and relate research in the pattern recognition area verbally and in writing.
PEC IT601D.3	Apply performance evaluation methods for pattern recognition, and critique comparisons of techniques made in the research literature.
PEC IT601D.4	Apply pattern recognition techniques to real-world problems such as document analysis and recognition.
PEC IT601D.5	Implement simple pattern classifiers, classifier combinations, and structural pattern recognizers.
PEC IT601D.6	Discuss the applications of pattern recognition in various applications.

Course Name: E-Commerce & ERP	**Code:**OEC IT601A
OEC IT601A.1	Describe the importance and impact of E-commerce on business models and strategies which help to have better concept of retailing by effective market research.
OEC IT601A.2	Compare and contrast different trading relationships among business and consumers.
OEC IT601A.3	Evaluate the effect in a supply chain, analyze the causes, and recommend possible solutions.
OEC IT601A.4	Apply the applications software skills such as analyzing spread sheets, creating database, and web browsing to apply to real-world business problems.
OEC IT601A.5	Classify various efficiency measures issues including network security in business communications.
OEC IT601A.6	Develop awareness of ethical, social and legal aspects of E-commerce including electronic payment system.

Course Name: Micro-electronics and VLSI Design	**Code:** OEC IT601B
OEC IT601B.1	Explain the principle of design of VLSI circuits.
OEC IT601B.2	Explain different MOS structure with characteristics.
OEC IT601B.3	Apply different processes for VLSI fabrication.
OEC IT601B.4	Use programming language for the design of logic circuits.
OEC IT601B.5	Draw the stick diagram and layout for simple MOS circuits.
OEC IT601B.1	Explain the principle of design of VVLSI circuits.

Course Name: Computer Networks Lab	**Code:** PCC IT691
PCC IT691.1	Defines hardware types related to computer network.
PCC IT691.2	Explains and evaluate network based commands and demonstrate their use.

PCC IT691.3	Demonstrate the performance of network protocol such as message queue, IPC.
PCC IT691.4	Implement the socket programming for client server architecture.
PCC IT691.5	Design and compares flow control mechanism stop and wait, Go back N etc.
PCC IT691.6	Design and Understand Setup /Configuration for several protocols.

Course Name: Advanced Java & Web Technology Lab **Code:** PCC IT692	
PCC IT692.1	Create and Mange static web pages for given scenario.
PCC IT692.2	Apply server side technologies to establish dynamic applications.
PCC IT692.3	To develop a dynamic webpage by the use of java script and DHTML.
PCC IT692.4	To create and write a well formed / valid XML document.
PCC IT692.5	Implement web applications with effective data management.
PCC IT692.6	Develop secure web applications with session management API's

Course Name: Multimedia Technology Lab **Code:** PCC IT693	
PCC IT693.1	Understand multimedia technology and basic tools used to manipulate sound, images, video and text.
PCC IT693.2	Acquire conceptual knowledge of animation.
PCC IT693.3	Develop an application using action script language.
PCC IT693.4	Create effective an interactive multimedia presentation by using multimedia devices.
PCC IT693.5	Contribute in a group to prepare a flash cartoon.
PCC IT693.6	Maintain effective web template using various website components.

B-Tech, 4th Year 7th Semester

Course Name: Quantum Computing **Code:** PEC IT701A	
PEC IT701A.1	Understand the implications of quantum computing on cryptography and security:- Understand the foundations of post-quantum cryptography.-Hack the RSA cryptosystem via a quantum computer.-Use quantum mechanics to obtain a monetary scheme.
PEC IT701A.2	Understand the quantum computing paradigm:-Have an overview of arrange of project management techniques-Understand how failure to correctly manage a project can lead to failure. - Understand how project management techniques provide quantifiable metrics for project progress.
PEC IT701A.3	Understand the power and limitation of quantum computers:- Understand the underlying power of quantum mechanics for computation.-Identify problems for which a quantum speed up is possible.- Understand the

	fundamental limitations of quantum algorithms.
PEC IT701A.4	State the four postulates of quantum mechanics and their application to computation: - Design and analyze quantum algorithms.- Grasp the notions of quantum states, unitary evolution, measurements, and composite systems.-Restate the postulates in terms of density matrices.
PEC IT701A.5	Understand the principles of quantum information and quantum communication:- Understand quantum teleportation and its limits.- Describe the framework of quantum error-correcting codes.- Discuss Everett's many worlds interpretation.
PEC IT701A.6	Analyze fundamental quantumalgorithms:-Shor'salgorithm.-Grover'ssearch.-TheBerstein-Vaziranialgorithm.-Simon'sproblem.-TheDeutsch-Jozsaparadigm.

Course Name: Cloud Computing **Code:**PEC-IT701B	
PEC IT701B.1	Understand various basic concepts related to cloud computing technologies.
PEC IT701B.2	Explain the architecture and concept of different cloud models: IaaS,PaaS,SaaS.
PEC IT701B.3	Demonstrate different cloud programming platforms and tools.
PEC IT701B.4	Differentiate the underlying principle of cloud virtualization, cloud storage, data management and data visualization.
PEC IT701B.5	Create application by utilizing cloud platforms such as Google app Engine and Amazon Web Services (AWS).
PEC IT701B.6	Justify scalable applications using AWS features.

Course Name: Neural Networks and Deep Learning **Code:** PEC IT701C	
PEC IT701C.1	Understand intuitively the mathematical and geometrical basis of how NN work and learn
PEC IT701C.2	Critically review the performance and applications of neural network and deep learning techniques.
PEC IT701C.3	Implement a systematic approach to design and evaluate neural network Architecture.
PEC IT701C.4	Interpret relevant mathematical equations or statistical methodologies in terms of neural network architecture and deep learning methods.
PEC IT701C.5	Investigate and apply knowledge discovery processes and associated models to innovate deep learning applications considering the importance of data privacy and professional ethics to support and provide business solutions.
PEC IT701C.6	Extrapolate knowledge and skills to design, develop, and evaluate a variety of deep learning tasks: modeling, clustering, dimensionality reduction, regression or classification.

Course Name: Adhoc Sensor Network **Code:** PEC IT701D	
PEC IT701D.1	**Define** the unique issues between cellular and ad-hoc networks and the challenges at various layers and its applications.
PEC IT701D.2	**Identify** the challenges in designing MAC, routing and transport protocols for wireless ad-hoc/sensor network sand scheduling mechanisms.
PEC IT701D.3	**Sketch** and **analyze** types of routing protocols used for uncast and multicast routing.
PEC IT701D.4	**Examine** the network security solution and routing mechanism.
PEC IT701D.5	Learn to **Select** about topology control and clustering in networks with Timing synchronization for localization services with sensor tasking and control.
PEC IT701D.6	Learn to **Design** about sensor node hardware and software platforms and develop the simulation and programming techniques with energy management schemes and Quality of service solution in ad-hoc networks.

Course Name: Operation Research **Code:** OEC IT701A	
OEC IT701A.1	Students should be proficient in the application of the laws of logic to mathematical statements. Select appropriate OR methods like Simplex, TP, TS, TSP, Network Analysis to apply to various types of problems in engineering and science inconsideration of the mathematical operations involved, accuracy requirements, and available computational resources.
OEC IT701A.2	Prepare students for realization of journal papers outcomes, and expose them to the world of research. Illustrate the current research works and publications of the subjects in different fields adopted by the students as per course curriculum in various journals and literature.
OEC IT701A.3	To explore and enhance research potential explain how the ideas those are adopted can be implemented through projects and demonstrate various models, recent project proposals executing the knowledge adopted from the course.
OEC IT701A.4	An ability to function on multi-disciplinary teams. Lighten on the latest and modern developments in the fields.
OEC IT701A.5	An understanding of professional, ethical, legal, security and social issues and responsibilities. An ability to analyze the local and global impact of computing on individuals, organizations, and society.
OEC IT701A.6	Select appropriate OR methods like Simplex, TP, TS, TSP, Network Analysis to apply to various types of problems in engineering and science inconsideration of the mathematical operations involved, accuracy requirements, and available computational resources.

Course Name: Introduction to Philosophical Thoughts **Code:** OEC IT701B	
OEC IT701B.1	Students read primary sources in philosophy and understand main arguments.
OEC IT701B.2	Students compare and contrast the core of a philosophical problem, issue, or question by referencing the inquiry to a system (history, topic, philosophers, etc.).
OEC IT701B.3	Students defend a philosophical position, view, or theory from more than one perspective.
OEC IT701B.4	Students develop and defend student's own philosophical point of view.
OEC IT701B.5	Students demonstrate a basic understanding of methods of philosophy
OEC IT701B.6	Students identify/recognize consistencies and inconsistencies of specific philosophical theories or worldviews.

Course Name: Soft Skills & Interpersonal Communication **Code:** OEC IT701C	
OEC IT701C.1	Communication: Students will maintain open, effective, and professional communications.
OEC IT701C.2	Professionalism: Students will demonstrate appropriate workplace demeanor and behavior
OEC IT701C.3	Problem-solving: Students will demonstrate flexibility; desire to meet challenges, and ability to find solutions.
OEC IT701C.4	Teamwork: Students will develop and maintain constructive working relationships.
OEC IT701C.5	Demonstration: Demonstrate acknowledgment and validation of the feelings, opinions, and contributions of others.
OEC IT701C.6	Application: Effectively apply active listening skills.

Course Name: Project Management and Entrepreneurship **Code:** HSMC IT701	
HSMC IT701.1	Understand project characteristics and various stages of a project.
HSMC IT701.2	Understand the conceptual clarity about project organization and feasibility analyses
HSMC IT701.3	Analyze the learning and understand techniques for Project planning, scheduling and Execution Control
HSMC IT701.4	Apply the risk management plan and analyze the role of stakeholders.
HSMC IT701.5	Understand the contract management, Project Procurement, Service level Agreements and productivity.
HSMC IT701.6	Understand the How Subcontract Administration and Control are practiced in the Industry.

Course Name: Project-1 **Code: Code:** PROJ IT781	
PROJ IT 781.1	Demonstrate a sound technical knowledge of their selected project topic.
PROJ IT 781.2	Undertake problem identification, formulation and solution.
PROJ IT 781.3	Design engineering solutions to complex problems utilising a systems approach.
PROJ IT 781.4	Conduct an engineering project.
PROJ IT 781.5	Communicate with engineers and the community at large in written an oral forms.
PROJ IT 781.6	Demonstrate the knowledge, skills and attitudes of a professional engineer.

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Course Name: Big Data Analytics **Code:** PEC IT801A	
PEC IT801A.1	Identify Big Data and its Business Implications.
PEC IT801A.2	List the components of Hadoop and Hadoop Eco-System
PEC IT801A.3	Manage Job Execution in Hadoop Environment
PEC IT801A.4	Develop Big Data Solutions using Hadoop Eco System
PEC IT801A.5	Analyze Info sphere Big Insights Big Data Recommendations.
PEC IT801A.6	Apply Machine Learning Techniques using R

Course Name: Cyber Law and Ethics **Code:** PEC IT801B	
PEC IT801B.1	Identify both external and internal vulnerabilities to enterprise computer infrastructures and sensitive digital assets and devise a mitigation plan against them.
PEC IT801B.2	Understand, analyze and work on activities of fraud prevention, monitoring, investigation, reporting
PEC IT801B.3	Compare the models, architectures, challenges and global legal constraints of secure electronic commerce technologies used to ensure transmission, processing and storage of sensitive information.
PEC IT801B.4	Have collection of information about security policies, establishing necessary organizational processes /functions for information security and will be able to arrange necessary resources
PEC IT801B.5	Evaluate the interaction and relative impact of human factors, processes and technology in cyber law infrastructures.
PEC IT801B.6	Identify the strengths and weaknesses of Indian IT act and ethics along with.

Course Name: Natural Language Processing	**Code:** PEC IT801C
PEC IT801C.1	Understand Natural Language Processing. (Understanding)
PEC IT801C.2	Probabilistic model of defining language and techniques.(Application)
PEC IT801C.3	Applying Hidden Markov model and Speech Recognition.(Application)
PEC IT801C.4	Application of context free grammar and language parsing.(Application)
PEC IT801C.5	Implement probabilistic and language parsing.(Application)
PEC IT801C.6	Differentiation of semantic and discourse in terms of NLP.(Analyze)

Course Name: Internet of Things	**Code:** PEC IT801D
PEC IT801D.1	Explain the definition and usage of the term "Internet of Things" in different contexts.
PEC IT801D.2	Understand the key components that make up an IoT system.
PEC IT801D.3	Differentiate between the levels of the IoT stack and be familiar with the key technologies and protocols employed at each layer of the stack.
PEC IT801D.4	Apply the knowledge and skills acquired during the course to build and test a complete, working IoT system involving prototyping, programming and data analysis.
PEC IT801D.5	Understand where the IoT concept fits within the broader ICT industry and possible future trends.
PEC IT801D.6	Appreciate the role of big data, cloud computing and data analytics in a typical IoT system.

Course Name: Cryptography and Network Security	**Code:** OEC IT801A
OEC IT801A.1	Recognize the various cryptographic techniques including private and public key cryptography, hashes and message digests
OEC IT801A.2	Realize about existing cryptographic utilities, digital signature and its applications
OEC IT801A.3	Identify with about classical encryption techniques and secure data communication.
OEC IT801A.4	Explore the design issues and working principles of various authentication protocols, different types of attacks and their characteristics.
OEC IT801A.5	Explore various communication standards as student may get knowledge about new strategies to secure data communication
OEC IT801A.6	Survey the idea of cryptographic utilities and authentication mechanisms to design secure applications.

Course Name: Mobile Computing	**Code:** OEC IT801B
OEC IT801B.1	Comprehend the basics of mobile Computing
OEC IT801B.2	Express the functionality of Mobile IP and Transport Layer

OEC IT801B.3	Classify different types of mobile telecommunication systems
OEC IT801B.4	Implement Adhoc networks with routing protocols
OEC IT801B.5	Use mobile operating systems in developing mobile applications
OEC IT801B.6	Synthesize new knowledge in the area of mobile computing by using appropriate techniques.

Course Name: Bio Informatics Code: OEC IT801C	
OEC IT801C.1	Understand the basic concept of Molecular Biology
OEC IT801C.2	Understand the theoretical basis behind bioinformatics
OEC IT801C.3	Search databases accessible on the WWW for literature relating to molecular biology and Information Technology
OEC IT801C.4	Manipulate DNA and protein sequences using stand-alone PC programs and programs available on the WWW. Able to write program for solving Biological Problems.
OEC IT801C.5	Find homologues, analyze sequences, construct and interpret evolutionary trees.
OEC IT801C.6	Apply the knowledge of Information Technology in Bioinformatics

Course Name: Robotics **Code:** OEC IT801D	
OEC IT801D.1	Upon completion of this course, the students can able to apply the basic engineering
OEC IT801D.2	To learn about knowledge for the design of robotics.
OEC IT801D.3	Will understand robot kinematics and robot programming.
OEC IT801D.4	Will understand application of Robots
OEC IT801D.5	To learn about force and torque sensing
OEC IT801D.6	To learn about application of robot

Course Name: Project 1 **Code:** PROJ IT881	
PROJ IT 881.1	Demonstrate a sound technical knowledge of their selected project topic.
PROJ IT 881.2	Undertake problem identification, formulation and solution.
PROJ IT 881.3	Design engineering solutions to complex problems utilizing a systems approach.
PROJ IT 881.4	Conduct an engineering project.
PROJ IT 881.5	Communicate with engineers and the community at large in written an oral forms.
PROJ IT 881.6	Demonstrate the knowledge, skills and attitudes of a professional engineer.