University of Engineering & Management, Kolkata
Department of Computer Science and Engineering (Internet of Things and Cyber Security including Block Chain Technology)
B.Tech (CSE (IOT, CYS, BCT) / CSBS)
2021 - 2025 Batch
6th Semester Structured Syllabus

Sr. No	Course Code	Course Title	Credits
1	PCCCSE601	Compiler Design	3
2	PCCCSE691	Compiler Design Laboratory	2
3	PCCCSE602	Computer Networks	3
4	PCCCSE692	Computer Networks Laboratory	2
5	PECCSE601B	Professional Elective-II: Embedded Systems	3
6	PECCSE602B	Professional Elective-III: Blockchain Technology	3
7	OECCSE601A	Open Elective - I: Finance & Accounting	3
8	HSMC(CS)602	Essential Studies for Professionals - VI	2
9	HSMC682	Skill Development for Professionals - VI	1
10	MC681	Mandatory Additional Requirements (MAR)	1
11	PROJCSE681	Project - I	3
12	MOOC 6	Massive Open Online Courses (Mandatory for B.Tech (Honours))	3
Total Credit Points of Semester [for B.Tech]			**26**
Total Credit Points of Semester [for B.Tech (Hons.)]			**29**

University of Engineering & Management, Kolkata
Syllabus for B. Tech Admission Batch 2021

Subject Name: Compiler Design

Subject Code: PCCCSE601

Credit: 3

Lecture Hours: 36

Module number	Topic	Sub-topics	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment
1	Introduction to Compiling and Lexical Analysis	Compilers, Analysis-synthesis model, The phases of the compiler, Cousins of the compiler. The role of the lexical analyzer, Tokens, Patterns, Lexemes, Input buffering, Specifications of a token, Recognition of tokens, Finite automata, From a regular expression to an NFA, From a regular expression to NFA, From a regular expression to DFA, Design of a lexical analyzer generator (Lex).	International Academia: (https://web.stanford.edu/class/cs143/syllabus.html) AICTE-prescribed syllabus: (https://www.aicte-india.org/sites/default/files/Model_Curriculum/Updated-AICTE%20-%20UG%20CSE.pdf) Industry Mapping: Ubuntu, GCC, Dev C++, Flex	8	Implementation of Symbol Table Develop a lexical analyzer to recognize a few patterns in C. (Ex. identifiers, constants, comments, operators etc.) Implementation of Lexical Analyzer using Lex Tool Installation of Flex
2	Syntax Analysis and Syntax directed translation	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	International Academia: (https://web.stanford.edu/class/cs143/syllabus.html) AICTE-prescribed syllabus: (https://www.aicte-india.org/sites/defaul	10	Generate YACC specification for a few syntactic categories. Implementation of Calculator using LEX and YACC

		parsers (SLR, LALR), Parser generators (YACC). Error Recovery strategies for different parsing techniques. Syntax directed definitions, Construction of syntax trees, Bottom-up evaluation of S attributed definitions, L attributed definitions, Bottom-up evaluation of inherited attributes.	t/files/Model_Curriculum/Updated-AICTE%20-%20UG%20CSE.pdf) Industry Mapping: YAAC, Bison		Installation of YACC and Bison Convert the BNF rules into Yacc form and write code to generate Abstract Syntax Tree.
3	Type checking and Run time environments	Type systems, Specification of a simple type checker, Equivalence of type expressions, Type conversions Source language issues (Activation trees, Control stack, scope of declaration, Binding of names), Storage organization (Subdivision of run-time memory, Activation records), Storage allocation strategies, Parameter passing (call by value, call by reference, copy restore, call by name), Symbol tables, dynamic storage allocation techniques.	International Standards : (https://web.stanford.edu/class/cs143/syllabus.html) AICTE prescribed syllabus: (https://www.aicte-india.org/sites/default/files/Model_Curriculum/Updated-AICTE%20-%20UG%20CSE.pdf) Industry Mapping: GCC, Dev C++	10	Implement type checking Implement control flow analysis and Data flow Analysis Implement any one storage allocation strategy. (Heap, Stack, Static)
	Intermediate code generation, Code optimization and Code generations	Intermediate languages, Graphical representation, Three-address code, Implementation of three address statements (Quadruples, Triples, Indirect triples). Introduction, Basic blocks & flow graphs, Transformation of basic blocks, Dag representation of basic blocks, The principle sources of optimization, Loops in	International Standards: (https://web.stanford.edu/class/cs143/syllabus.html) AICTE prescribed syllabus: (https://www.aicte-india.org/sites/default/files/Model_Curriculum/Updated-AICTE%20-%20UG%20CSE.pdf) Industry Mapping: GCC, Dev C++	8	.Construction of DAG 2.Implement the back end of the compiler which takes the three address code and produces the 8086 assembly language instructions that can be assembled and run using a 8086 assembler. The target assembly instructions can be simple move, add, sub, jump. Also simple

		flow graph, Peephole optimization. Issues in the design of code generator, a simple code generator, Register allocation & assignment.			addressing modes are used.

University of Engineering & Management, Kolkata
Syllabus for B. Tech Admission Batch 2021

Subject Name: Computer Networks

Subject Code: PCCCSE602

Credit: 3

Lecture Hours: 36

Module No.	Topic	Sub-topic	Mapping with Industry and International Academia	Lecture Hours	Hands-On Experiment (Laboratory)
1	Overview of Data Communication and Networking and Physical level.	Introduction; Data communications: components, data representation (ASCII, ISO etc.), direction of data flow (simplex, half duplex, full duplex); network criteria, physical structure (type of connection, topology), categories of network (LAN, MAN, WAN); Internet: brief history, Protocols and standards; Reference models: OSI reference model, TCP/IP reference model, their comparative study. Overview of data(analog & digital), signal(analog & digital), transmission (analog & digital) & transmission media (guided & unguided); Circuit switching: time division & space division switch, TDM bus; Telephone Network;	International Academia: https://www.scs.stanford.edu/10au-cs144/sched/ AICTE prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/Updated-AICTE%20-%20UG%20CSE.pdf Industry mapping: Wieshark, CISCO, DLINK,	10	**1.** Use Linux tools like ifconfig, dig, ethtool, route, netstat, nslookup, and ip to understand the networking configuration of the computer that the student is working on. **2.** Use Wireshark to capture packets when browsing the Internet. Examine the structure of packets: the various layers, protocols, headers, payload.
2	Data link Layer and Medium Access sub layer.	Types of errors, framing (character and bit stuffing), error detection & correction methods; Flow control; Protocols: Stop & wait ARQ, Go-Back- N ARQ, Selective repeat ARQ, HDLC; Point to Point Protocol, LCP, NCP, Token Ring; Reservation, Polling, Multiple access protocols: Pure ALOHA, Slotted ALOHA, CSMA, CSMA/CD,	International Academia: https://www.scs.stanford.edu/10au-cs144/sched/ AICTE prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/Updated-AICTE%20-%20UG%20CSE.pdf Industry mapping: NS2/NS3, Java, Python	8	**1.** Use Linux network tools like ethtool to observe and analyze link layer packet statistics and errors. **2.** Use NS2/NS-3 to simulate medium access protocols. Observe contention, collisions and packet loss in

		CSMA/CA Traditional Ethernet, fast Ethernet(in brief);			medium access protocols. Observe the working of error detection/recovery mechanisms.
3	Network layer and Transport Layer.	Internetworking & devices: Repeaters, Hubs, Bridges, Switches, Router, Gateway; Addressing: IP addressing, subnetting; Routing: techniques, static vs. dynamic routing, Unicast Routing Protocols: RIP, OSPF, BGP; Other Protocols: ARP, IP, ICMP, IPV6; Process to Process delivery; UDP; TCP; Congestion Control: Open Loop, Closed Loop choke packets; Quality of service: techniques to improve QoS: Leaky bucket algorithm, Token bucket algorithm.	International Academia: https://www.scs.stanford.edu/10au-cs144/sched/ AICTE prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/Updated-AICTE%20-%20UG%20CSE.pdf Industry mapping: CISCO Packet Tracer, Java, Python. https://www.netacad.com/courses/packet-tracer	10	**1.** Use tools like ping and traceroute to explore various Internet paths to popular servers. **2.** Measure TCP throughput between two hosts in a network using tools like iperf. Modify TCP configuration parameters. Use the tc Linux utility or similar to control bandwidth, delay, loss. Observe impact on measured throughput.
4	Application Layer and Modern topics.	Introduction to DNS, SMTP, SNMP, FTP, HTTP & WWW; Security: Cryptography (Public, Private Key based), Digital Signature, Firewalls. ISDN services & ATM, DSL technology, Cable Modem: Architecture & Operation in brief Wireless LAN: IEEE 802.11, Introduction to blue-tooth.	International Academia: https://www.scs.stanford.edu/10au-cs144/sched/ AICTE prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/Updated-AICTE%20-%20UG%20CSE.pdf Industry mapping: CISCO Packet Tracer, NS2/NS3, Wireshark. https://www.netacad.com/courses/packet-tracer	8	**1.** Install and configure some network applications, e.g. Apache, Bind (DNS), etc. **2.** Understand various header fields and their usage in different application layer protocols using Wireshark packet capture. **3.** Simulate transport protocols optimized for data centers in NS-2/NS-3.

University of Engineering & Management, Kolkata
Syllabus for B. Tech Admission Batch 2021

Subject Name: Professional Elective-II: Embedded Systems

Subject Code: PECCSE601B

Credit: 3

Lecture Hours: 36

Pre-Requisite:
1. Assembly language concepts
2. Operating system concepts
3. Computer organization and architecture concepts
4. Design analysis of different day to day equipments

Course Outcome:
1. Students have knowledge about the basic functions, structure, concepts and applications of embedded systems.
2. To learn the method of designing and program an Embedded Systems for real time applications.
3. To understand operating system concepts and types.
4. Students have knowledge about basic communication protocols.
5. To understand different concepts of a RTOS, sensors, memory interface, communication interface.

Module Number	Topic	Sub-topics	Mapping with Industryand International Academia	Lecture Hours	Corresponding Lab Assignment
1	Introduction to embedded systems	Definition of embedded system, embedded systems vs general computing systems, classification of embedded systems, embedded hardware units, embedded software, application of embedded systems, characteristics and quality attributes of embedded systems.	International Academia: https://web.stanford.edu/class/cs240e/ AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_ECE.pdf Industry Mapping: Hardware Chipset: Motorola 68HC11, PIC 16F84, Microchip 8051 Software: LabVIEW and VHDL	6	NA
2	The typical embedded system	Core of the embedded system, processors, memory, input and output devices, communication interface, timer and counting devices, power supply, embedded firmware, other system components.	International Academia: https://web.stanford.edu/class/cs240e/ AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model%20Curriculum%20for%20Minor%20Degree%20for%20UG%20Degree%20	7	NA

			Courses%20in%20Engineering%20&%20Technology.pdf Industry Mapping: Hardware Chipset: Motorola 68HC11, PIC 16F84, Microchip 8051, ARM Cortex-M3, ARM Cortex R4 Software: LabVIEW and VHDL		
3	Embedded firmware design and development	Embedded firmware design, embedded firmware development languages, programming in embedded C.	International Academia: https://web.stanford.edu/class/cs240e/ AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_ECE.pdf Industry Mapping: Software: LabVIEW and VHDL	6	NA
4	RTOS based embedded system design	Operating system basics, types of operating systems, need of real-time operating system, features of a real-time operating system, commercial real-time operating systems, tasks, process, threads, multiprocessing and multi-tasking, architecture of kernel, real-time task scheduling, threads-processes-scheduling putting them together, task communication, task synchronization, device drivers, memory management, interrupt service mechanism, context switching.	International Academia: https://web.stanford.edu/class/cs240e/ AICTE-prescribed syllabus: https://old.aicte-india.org/downloads/MODEL_SYLLABI_FOR_UG_Computer_Sci_Engg.pdf Industry Mapping: Software: LabVIEW	7	NA
5	Integration and testing of embedded hardware and firmware	Integration of hardware and firmware, boards bring up.	International Academia: https://web.stanford.edu/class/cs240e/ AICTE-prescribed syllabus: https://old.aicte-india.org/downloads/MODEL_SYLLABI_FOR_UG_Computer_Sci_Engg.pdf Industry Mapping: Hardware Chipset: Motorola 68HC11, PIC 16F84, Microchip 8051, ARM Cortex-M3, ARM Cortex R4 Software: LabVIEW and VHDL	4	

6	The embedded system development environment	The integrated development environment (IDE), types of files generated on cross-compilation, disassembler/decompiler, simulators, emulators and debugging, target hardware debugging, boundary scan.	International Academia: https://web.stanford.edu/class/cs240e/ AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_ECE.pdf Industry Mapping: Software: LabVIEW	6	NA

Text / Reference Books:

1. Shibu, K. V. "Introduction to embedded systems," Tata McGraw-Hill Education.
2. Rajkamal, "Embedded Systems Architecture, Programming and Design," Tata McGraw-Hill.
3. Vahid, Frank, and Tony D. Givargis. "Embedded system design: a unified hardware/software introduction," John Wiley & Sons.
4. David E. Simon, "An Embedded Software Primer," Pearson Education Asia, First Indian Reprint 2000.
5. Vahid, Frank, and Tony D. Givargis. "Embedded system design: a unified hardware/software introduction," John Wiley & Sons, 2001.
6. Das, Lyla B. "Embedded systems: An integrated approach," Pearson Education India.

Subject Name: Professional Elective-III: Blockchain Technology

Subject Code: PECCSE602B

Credit: 3

Lecture Hours: 36

Module Number	Topic	Sub-topics	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment
1	Introduction	Need for Distributed Record Keeping, Modeling faults and adversaries, Byzantine Generals problem, Consensus algorithms and their scalability problems, Why Nakamoto Came up with Blockchain based cryptocurrency? Technologies Borrowed in Blockchain – hash pointers, consensus, byzantine fault-tolerant distributed computing, digital cash etc.	International Academia: https://ocw.mit.edu/courses/15-s12-blockchain-and-money-fall-2018/pages/syllabus/ AICTE-prescribed syllabus: (https://www.aicte-india.org/sites/default/files/Model_Curriculum/Minor%20Degree_Dec_2020.pdf) Industry Mapping: manufacturing applications, such as inventory management, maintenance and quality control	8	NA
2	Basic Distributed Computing	Atomic Broadcast, Consensus, Byzantine Models of fault tolerance	International Academia: https://ocw.mit.edu/courses/15-s12-blockchain-and-money-fall-2018/pages/syllabus/ AICTE-prescribed syllabus: (https://www.aicte-india.org/sites/default/files/Model_Curriculum/Minor%20Degree_Dec_2020.pdf) Industry Mapping: manufacturing applications, such as inventory management, maintenance and quality control	4	NA

3	Basic Crypto primitives	Hash functions, Puzzle friendly Hash, Collison resistant hash, digital signatures, public key crypto, verifiable random functions, Zero-knowledgesystems.	International Academia: https://ocw.mit.edu/courses/15-s12-blockchain-and-money-fall- 2018/pages/syllabus/ AICTE-prescribedsyllabus: (https://www.aicte-india.org/sites/default/files/Model_Curriculum/Minor%20Degree_Dec_2020.pdf) Industry Mapping: digitalsignatures	6	NA
4	Blockchain 1.0	Bitcoin blockchain, the challenges, and solutions, proof of work, Proof of stake, alternatives to Bitcoin consensus, Bitcoin scripting language and their use.	International Academia: https://ocw.mit.edu/courses/15-s12-blockchain-and-money-fall- 2018/pages/syllabus/ AICTE-prescribedsyllabus: (https://www.aicte-india.org/sites/default/files/Model_Curriculum/Minor%20Degree_Dec_2020.pdf) Industry Mapping: In Industry 4.0 environment, real-time information	6	NA
5	Blockchain 2.0	Ethereum and Smart Contracts, The Turing Completeness of Smart Contract Languages and verification challenges, Using smart contracts to enforce legal contracts, comparing Bitcoin scripting vs. Ethereum Smart Contracts.	International Academia: https://ocw.mit.edu/courses/15-s12-blockchain-and-money-fall- 2018/pages/syllabus/ AICTE-prescribed syllabus: (https://www.aicte-india.org/sites/default/files/Model_Curriculum/Minor%20Degree_Dec_2020.pdf) Industry Mapping: FinTech & banking, Healthcare, Supply chain management, Insurance. Real estate. property (IP) protection.	4	NA

6	Blockch ain 3.0	Hyperledger fabric, the plug and play platform and mechanisms in permissioned blockchain	International Academia: https://ocw.mit.edu/courses/15-s12-blockchain-and-money-fall- 2018/pages/syllabus/ AICTE-prescribed syllabus: (https://www.aicte-india.org/sites/default/files/Model_C urriculum/Minor%20Degree_Dec_20 20.pdf) Industry Mapping : improvesupply chain processes byincreasing transparency and traceability of transactions	4	NA
7	Privacy, Security issues in Blockchai n	Blockchain: Pseudo-anonymityvs. anonymity, Zcash and Zk- SNARKS for anonymity preservation,attacks on	International Academia: https://ocw.mit.edu/courses/15-s12-blockchain-and-money-fall- 2018/pages/syllabus/ AICTE-prescribed syllabus: (https://www.aicte-india.org/sites/default/files/Model_C urriculum/Minor%20Degree_Dec_20 20.pdf) Industry Mapping: Tracking the authenticity of supplies,Equipment maintenance, Product life-cycle monitoring, Inventory management. and SCM	4	NA

Subject Name: Open Elective - I: Finance & Accounting

Subject Code: OECCSE601A

Credit: 3

Lecture Hours: 36

Module number	Topic	Sub-topics	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment
1	Introduction to Finance and Accounting	The principles of financial and cost accounting Financial Management, Financial Planning and Capitalization- definitions, objectives, changing roles and functions, Financial Decision. Basic accounting concepts, important definitions, uses, limitations, advantages; types of Accounting, Financial statements, introduction to Journal Accounting; double entry bookkeeping, different types of transactions related to Financial Accounting .	International Academia: (Accounting, Finance & Valuation Course I Stanford Online) AICTE-prescribed syllabus: (Microsoft Word - Information_Technology_Syllabus.doc (makautwb.ac.in)) Industry Mapping: Designing an accounting system	8	Easy Tally. 2. Preparation of Basic financial and accounting statements
2	Capital Budgeting	Managerial accounting tools and practices Nature of Investment decision, Importance of Capital Budgeting, The Capital. Budgeting Process - Investment Criterion, Pay-back period, Accounting,	International Standards :(Accounting, Finance & Valuation Course I Stanford Online) AICTE prescribed syllabus: (Microsoft Word - Information_Technology_Syllabus.doc (makautwb.ac.in)	6	Mapping and Techniques using Excel and Tally

		ROR (Rate of Return) Method, Discounting Cash flow method, Net – present value method, IRR (Internal Rate of Return) method, The benefit-Cost Ratio method.	Industry Mapping: Financial long term forecasting		
3	Manageme nt of Working Capital	Various concepts, Elements, Classification, Financing and importance of working capital, Investment analysis, Cash flow determination, cost of capital, capital budgeting methods.	International Standards: (Accounting, Finance & Valuation Course I Stanford Online) AICTE prescribed syllabus: (Microsoft Word - Information_Technology_Syll abus.doc (makautwb.ac.in) Industry Mapping: Financial daily or short term fund planning and management	8	Mapping Techniques using Tally and Excel
4	Cost – Volume – Profit Analysis	Analysis of Costing and Classification of costs, Allocation, apportionment and absorption, Cost centers, different costing systems, Cost analysis for managerial decisions, Meaning of Linear CVP analysis, Objectives, Assumptions, Break – Even analysis, determining the Break-Even point profit, Volume graph profit, Volume ratios margin of Safety.	International Standards: (Accounting, Finance & Valuation Course I Stanford Online) AICTE prescribed syllabus: (Microsoft Word - Information_Technology_Syll abus.doc (makautwb.ac.in) Industry Mapping: Analysis of sales and cost dependency on profit margin using cost analysis methods.	8	Mapping and solving Techniques using Tally and Excel

5	Financial Control	Posting of Ledgers and preparation of Trial Balance; preparation of Balance Sheet and Profit and Loss Accounts; Controlling other departments by Financial Accounting (A practical Approach).	AICTE prescribed syllabus: (Microsoft Word - Information_Technology_Syllabus.doc (makautwb.ac.in) Industry Mapping: Design and analysis of company health using Balance sheet using available tools and techniques	6	

Subject Name: Essential Studies for Professionals - VI

Subject Code: HSMC(CS)602

Credit: 2

GATE exam Syllabus

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Subject Name: Skill Developments for Professionals - VI

Subject Code: HSMC682

Credit: 1

Quantitative Aptitude