



University of Engineering & Management, Kolkata
University of Engineering & Management, Jaipur
Institute of Engineering & Management, Kolkata

B.Tech in CSE, IT and Allied Branches

Course Structure

Third Semester

Batch: 2025-2029

Semester III (Second year) Curriculum								
Sl. No	Type of course	Course Code	Course Name	Hours per week				Credit Points
				Lecture	Tutorial	Practical	Sessional	
Theory Papers								
1	Engineering Science Course	ESC301	Analog Electronic Circuits	3	0	0	0	3
2	Engineering Science Course	ESC302	Digital Electronics	3	0	0	0	3
3	Professional Core Course	PCCCS301	Data structure & Algorithms	3	0	0	0	3
4	Basic Science course	BSM301	Mathematics - III	3	0	0	0	3

5	Humanities & Social Sciences including Management course	HSMCS301	Humanities - I (Principles of Management)	3	0	0	0	3
6	Humanities & Social Sciences including Management course	ESP301	Essential Studies for Professionals - III	2	0	0	0	0.5
Total				17	0	0	0	15.5
Practical Papers								
1	Engineering Science Course	ESC391	Analog Electronic Circuits Laboratory	0	0	4	0	2
2	Professional Core Course	PCCCS391	Data Structure & Algorithms Laboratory	0	0	4	0	2
3	Engineering Science Course	ESC392	Digital Electronics Laboratory	0	0	4	0	2
Total				0	0	12	0	6
Sessional Papers								
1	Humanities & Social Sciences including Management course	SDP381	Skill Development for Professionals - III	0	0	0	2	0.5
2	Professional Core Course	PCCCS381	IT Workshop	0	0	0	4	2
3	Innovative Project	PRJCS381	Innovative Project – I	0	0	0	0	1
	Total			0	0	0	6	3.5
Mandatory Requirements								

Sl. No	Type of course	Course Code	Course Name	Hours per week				Score/Credit /Count
1	Co-curricular & Extra Curricular Activities	MAR	Mandatory Additional Requirements (Score)	-	-	-	-	-
2	Honours	MOOCs	Massive Open Online Courses (Credit)	-	-	-	-	-
3	Certification	IFC	Industry and Foreign Certification (Count)	-	-	-	-	-
Total				17	0	12	6	26



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B.Tech in Computer Science and Engineering

DETAILED SYLLABUS

Course Code- ESC301

Course Title – Analog Electronics Circuits

Credit – 3

Category – Professional Core Course

Semester – III

L:T:P:S – 3:0:0:0

Pre-requisite – Basic Electronics

Course Outcomes:

CO1	Design and analyze various rectifiers, amplifier circuits and oscillators.
CO2	Understand the characteristics and applications of transistors.
CO3	Understand the functioning of OP-AMP and design OP-AMP based circuits.
CO4	Understand the concept of Multivibrator and timer.

<u>Study Material</u>	<u>Coursera</u>	<u>NPTEL</u>	<u>Linkedin Learning</u>	<u>Infosys Springboard</u>
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Module No.	Topic	Sub-topics	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignments	Textbook Mapping
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1	Rectifiers, Filters and Regulators	Introduction to full-wave and half-wave rectifiers. Capacitor filter, Inductor filter, LC and pi-section filter. Series and Shunt voltage regulator, percentage regulation. Regulator ICs 78xx and 79xx series. Introduction to SMPS.	International Academia: (https://explorecourses.stanford.edu/search?q=EE101A) (https://explorecourses.stanford.edu/search?q=EE101B) https://ocw.mit.edu/courses/6-101-introductory-analog-electronics-laboratory-spring-2007/pages/syllabus/ AICTE-prescribed syllabus: https://www.aicte.gov.in/sites/default/files/Model_Curriculum/Final_ECE%20after%20addedum.pdf Industry Mapping: LT-SPICE software, LabView, Tinkercad, Proteus. Hardware Chipset: IN4001/4007, 7815, 7915.	8	1. Simulation of full-wave and half-wave rectifiers with and without filter using software/hardware to study of Ripple and Regulation characteristics.	1. Boyles tad Chapter: 2 (rectifiers), 15
2	1. Transistor Biasing and Stability of Q-point	Operating point, Graphical analysis of transistor amplifiers; Transistor Biasing (fixed/base bias, collector-to-base bias, self/voltage-divider bias), Stability factors, Bias stabilization; h-parameter model of transistors, Analysis of transistor amplifier (CE, CB, CC) employing h-parameters: expression of voltage gain, current gain, input impedance, output impedance, power gain; High frequency effect	International Academia: (https://explorecourses.stanford.edu/search?q=EE101A) (https://explorecourses.stanford.edu/search?q=EE101B) https://ocw.mit.edu/courses/6-101-introductory-analog-electronics-laboratory-spring-2007/pages/syllabus/ AICTE-prescribed syllabus: https://www.aicte.gov.in/sites/default/files/Model_Curriculum/Final_ECE%20after%20addedum.pdf Industry Mapping: LT-SPICE	8	2. Simulation of transistor circuit with self bias using software/hardware to study parameters of Q-point. 3. Simulation of transistor amplifier with potential divider bias using software/hardware to study output voltage and gain for an input signal.	1. Rakshit Chapter: 8

		in transistors.	<i>software, LabView, Tinkercad, Proteus.</i> <i>Hardware Chipset: BC547, SL100</i>			
	2. Transistor Amplifiers	Classification of amplifiers; RC coupled transistor amplifier, Analysis of RC coupled amplifier at three frequency ranges in terms of voltage/current gain and input/output impedances, frequency response characteristics, lower and upper cut off frequencies, bandwidth; Tuned amplifiers (single-tuned)	<i>International Academia:</i> <i>(https://explorecourses.stanford.edu/search?q=EE101A)</i> <i>(https://explorecourses.stanford.edu/search?q=EE101B)</i> https://ocw.mit.edu/courses/6-101-introductory-analog-electronics-laboratory-spring-2007/pages/syllabus/ <i>AICTE-prescribed syllabus:</i> https://www.aicte.gov.in/sites/default/files/Model_Curriculum/Final_ECE%20after%20added_um.pdf - <i>Industry Mapping:</i> <i>LT-SPICE, LabView, Tinkercad, Proteus software.</i> <i>Hardware Chipset: SL 100, BC547.</i>	4	4. Simulation of two stages R-C coupled amplifier using software/hardware to study its gain and bandwidth.	1. Rakshit Chapter: 9

3	Operational Amplifier (OPAMP), Applications of OPAMP	Introduction to operational amplifier: Differential Amplifier circuit; OPAMP Basics, Ideal OPAMP; OPAMP specifications- DC offset parameters (input/output offset voltage/current), frequency parameters (gain-bandwidth, slew rate, maximum signal frequency), differential & common-mode operation (CMRR); inverting & non inverting amplifiers, voltage follower/buffer circuit. Applications of Operational Amplifiers: voltage adder & subtractor, integrator & differentiator, analog multiplier & divider, voltage-to-current/current-to-voltage converters, logarithmic amplifier, antilog-amplifier, comparator, Instrumentation Amplifier, schmitt trigger, precision rectifier	International Academia: (https://explorecourses.stanford.edu/search?q=EE101A) (https://explorecourses.stanford.edu/search?q=EE101B) https://ocw.mit.edu/courses/6-101-introductory-analog-electronics-laboratory-spring-2007/pages/syllabus/ AICTE-prescribed syllabus: https://www.aicte.gov.in/sites/default/files/Model_Curriculum/Final_ECE%20after%20addedum.pdf - Industry Mapping: <i>LT-SPICE software, LabView, Tinkercad, Proteus.</i> <i>Hardware Chipset: IC741, IC328, IC AD633,</i>	10	5. Simulation of Inverting and Non-Inverting Amplifier using Op-Amp and using hardware/ software. 6. Simulation of differentiator and integrator circuit using Op-Amp and using hardware/ software. 7. Simulation of summing amplifier using Op-Amp and using hardware/ software. 8. Simulation of Logarithmic and Anti Logarithmic Amplifier circuit using hardware/ software.	1. Boyles tad Chapter: 10, 11 2. Gayakwad Chapter: 6, 8
4	Feedback Amplifiers, Oscillators, Multivibrators	Feedback amplifiers: Feedback concept, negative & positive feedback: advantages & applications; voltage/ current, series/shunt feedback topologies: analysis of effects of	International Academia: (https://explorecourses.stanford.edu/search?q=EE101A) (https://explorecourses.stanford.edu/search?q=EE101B) https://ocw.mit.edu/courses/6-101-introductory-analog-	6	9. Simulation of Phase shift oscillator using OPAMP (hardware/ software) to study frequency of oscillation by varying component values.	1. Rakshit Chapter: 10, 11

		negative feedback. Oscillators: Berkhausen criterion, pole-zero concept, Hartley, Colpitts, Phase shift, Wein bridge and crystal oscillators. Multivibrators: Monostable, Bistable, Astable multivibrators using transistor and OPAMP; Monostable and astable operation using 555 timer.	electronics-laboratory-spring-2007/pages/syllabus/ AICTE-prescribed syllabus: https://www.aicte.gov.in/sites/default/files/Model_Curriculum/Final_ECE%20after%20added%20um.pdf Industry Mapping: <i>LT-SPICE software, LabView, Tinkercad, Proteus.</i> <i>Hardware Chipset: SL100, IC 741, IC555.</i>		10. Simulation of Monostable Multivibrator using IC555 and using software. 11. Simulation of Astable Multivibrator using IC555 and using software. 12. Simulation of Schmitt trigger circuit using IC555 and using software.	
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Textbooks:

1. Boylestad, Robert L., and Louis Nashelsky. Electronic devices and circuit theory. Pearson.
2. Electronics Fundamentals and Applications, D. Chattopadhyay and P. C. Rakshit. and Applications", 13th Edition, New Age International Publishers
3. Op-amps and Linear IC's, R.A. Gayakwad, PHI.

Reference books:

1. Sedra, Adel S., and Smith, Kenneth C. Microelectronic Circuits- Theory and Applications. Oxford University Press.
2. Soumitra K. Mandal. Analog Electronic Circuits. Second Edition. Mc Graw Hill Company.
3. Electronic principles, 6th Edition, Malvino, Mc Graw Hill Company.
4. Operational Amplifier & Linear IC's, Bell, Oxford University Press.
5. Microelectronic Circuit- Analysis & Design, Rashid, Cengage Learning.
6. 2000 Solved Problems in Electronics, Jimmie J. Cathey, Mc Graw Hill Inc.

Online Resources: <https://ocw.mit.edu/courses/6-101-introductory-analog-electronics-laboratory-spring-2007/>
https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_ee174
<https://www.coursera.org/learn/electronics>
<https://www.linkedin.com/learning/electronics-foundations-basic-circuits>

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	1	1	-	-	-	-	1	-	3
CO2	3	3	2	2	2	1	-	-	-	1	-	3
CO3	3	3	3	3	3	2	1	-	1	1	3	3
CO4	3	3	2	1	-	-	-	-	-	-	-	3

3: Strong correlation

2: Medium correlation

1: Weak correlation

Workshop/Seminar/Bootcamp/Hackathon based Learning

Module number	Topic	Sub-topics	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment
1	FET	JFET, MOSFET, CMOS, MOS capacitor, C-V characteristics, MOSFET, I-V characteristics, and small signal models of MOS transistor	International Academia: https://ocw.mit.edu/courses/6-701-introduction-to-nanoelectronics-spring-2010/d4cf00dfef7119a36223c743b2e3b424_MIT6_701S10_part5.pdf Prescribed syllabus: https://www.aicte.gov.in/sites/default/files/ug-vol1.pdf Industry Mapping: https://www.semiconductorforu.com/applications-fet-field-effect-transistor/	NA	Online Resource (Coursera): https://www.coursera.org/learn/transistor-field-effect-transistor-bipolar-junction-transistor Workshop/Seminar/Bootcamp/Hackathon is strongly recommended for this module
2	Special Functional Circuits	VCO, PLL	International Academia: https://ocw.mit.edu/courses/6-331-advanced-circuit-techniques-spring-2002/82a699243437c9217f47822034943ca7_lab3.pdf https://ocw.mit.edu/courses/res-6-010-electronic-feedback-systems-spring-2013/resources/lecture-19-phase-locked-loops/ Prescribed syllabus: https://www.aicte.gov.in/sites/default/files/ug-vol1.pdf Industry Mapping: https://www.dynamicengineers.com/content/the-role-of-voltage-controlled-oscillators-vcos-in-pll-design	NA	Online Resource (Class Central): https://www.classcentral.com/subject/phase-locked-loops Workshop/Seminar/Bootcamp/Hackathon is strongly recommended for this module



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B.Tech in Computer Science and Engineering

DETAILED SYLLABUS

Course Code- ESC302

Course Title – Digital Electronics

Credit – 3

Category – Engineering Science Course

Semester – III

L:T:P:S – 3:0:4:0

Pre-requisite – Basic knowledge Basic Electronics

Course Outcomes:

CO1	Students would be able to convert from one number system to another, work out and design problems related to Boolean algebra, minimization etc.
CO2	Students should have the ability to identify basic requirements for a design application and propose a cost-effective solution.

CO3	Students should have the ability to understand, analyse and design various combinational and sequential circuits.
CO4	Students should have the ability to understand and analyse the fundamental concepts of logic families.

Study Material	Coursera	NPTEL	Linkedin Learning	Infosys Springboard 5G
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Module No.	Topic	Sub-topics	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignments	Textbook Mapping
1	Introduction to Number System and Boolean Logic	Number System:[2L] Decimal, binary, octal, hexadecimal number system and conversion. Binary weighted codes: BCD, Excess-3, Gray codes and their conversions, ASCII, EBCDIC [2L]; Signed binary number representation with 1's and 2's complement methods, Binary arithmetic [1L]; Boolean algebra, Various properties (associative, distributive properties), DeMorgan's theorem, the realization of functions using logic gates [2L];	International Academia: https://ocw.mit.edu/courses/6-111-introductory-digital-systems-laboratory-spring-2006/ https://online.stanford.edu/courses/ee273-digital-systems-engineering AICTE-prescribed	12	Hardware Experiments (Experiments can be performed in 7400 series IC or 4000 series IC) - Familiarity with basic gates ICs and Realization of NOT, AND, OR and XOR operations by using universal gates (both NAND and NOR) - Design a logic circuit of	Textbook-1 Chapters: 1 to 3

		Representation in SOP and POS forms, [2L]; Minimization of logic expressions by KMAP (function with two, three, four and five variables)[3L]	<i>syllabus:</i> https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf <i>Industry Mapping:</i> <u>Proteus software for simulation</u> https://www.labcenter.com/		function $F=A'B+C'D$ 3. i)Design a circuit to indicate 4 bits odd and even numbers. ii)Realization of a circuit to display prime and non-prime numbers (4 bit) <u>Software Experiments</u> Above mentioned experiments can be performed in any of the following simulation platform 1. Circuitverse (https://circuitverse.org/simulator) 2. Design of basic digital circuits using Tinkercad. https://www.tinkercad.com/things/b91	
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					zk1E9SHy-bodacious-maimu-tumelo/editel?tenant=circuits 3. Proteus software for simulation 4. Logisim simulator platform	
2	Analysis & design of Combinational Logic	Combinational circuits - Adder and Subtractor circuits (half and full adder, half and full subtractor) [2L]; Design of Code converters, Encoder, Decoder, Magnitude Comparator, Multiplexer, De-Multiplexer, Parity Generator, Parity Checker [10L].	International Academia: 1. https://ocw.mit.edu/courses/6-111-introductory-digital-systems-laboratory-spring-2006/ 2. https://online.stanford.edu/courses/ee273-digital-systems-engineering AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-	12	Hardware Experiments 5. Design a Half Adder using basic gates and verify its output. 6. Design a Half Subtractor using basic gates and verify its output. 7. Design a Full Adder using basic gates and verify its output. 8. Design a Full Subtractor using basic gates and verify its output. 9. Design Binary to Gray code converter and Gray to Binary code converter	Textbook-1 Chapters: 4,5 Textbook-2 Chapters: 5,6

			%20UG%20CSE.p df Industry Mapping: <u>Proteus software for simulation</u> https://www.labcente r.com/		using logic gates 10. Design BCD to Excess 3 code converter and Excess 3 to BCD code converter using logic gates 11. Design of 4:1 Multiplexer circuits using logic gates. 12. Design of 1: 4 Demultiplexer circuits using logic gates. 13. Design of 8:1 Multiplexer circuits using logic gates. 14. Design of 1: 8 Demultiplexer circuits using logic gates. 15. Design of 4:2 encoder circuits using logic gates	
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					16. Design of 2:4 decoder circuits using logic gates 17. Design parity generator and parity checker circuit using logic gates	
3	Sequential Logic Circuit	Sequential Circuits - Latch & Basic Flip-flops [1L]; Types of Flip-flops -SR, JK, D, T and JK Master slave Flip-flops[3L]; Finite State Machine: State equations ,State table , State diagram[2L] Basic concept of Synchronous and Asynchronous counters, Up counter and down counter[2L]; Design of Mod N Counter [3L]; Ring counter, Johnson counter [1L]; Shift Registers (SISO, SIPO, PIPO, PISO) [2L].	International Academia: 1. https://ocw.mit.edu/courses/6-111-introductory-digital-systems-laboratory-spring-2006/ 2. https://online.stanford.edu/courses/ee273-digital-systems-engineering AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%2	14	18. Design of R-S, J-K, D and T Flip flops using logic gates and also study master-slave J-K flip flop 19. Design of Mod N counter 20. Design of 4-bit shift register (SISO, SIPO, PIPO, PISO)	Textbook-1 Chapters:6,7 Textbook-3 Chapters: 7,8,9

			0- %20UG%20CSE.p df Industry Mapping: <u>Proteus software for simulation</u> https://www.labcente r.com/			
4	Digital integrated circuits	Fundamentals of Logic families- TTL, ECL, MOS, and CMOS - basic concepts; Logic levels, propagation delay time, power dissipation fan-out and fan-in, noise margin, logic families and their characteristics	International Academia: 3. https://ocw.mit.ed u/courses/6-111- introductory- digital-systems- laboratory- spring-2006/ 4. https://online.st anford.edu/cour ses/ee273- digital-systems- engineering AICTE-prescribed syllabus: https://www.aicte- india.org/sites/defa ult/files/Model_Cur	2		Textbook-1 Chapters:13 Textbook-3 Chapters: 4

			riculum/AICTE%20-%20UG%20CSE.pdf Industry Mapping: <u>Proteus software for simulation</u> https://www.labcenter.com/			
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Textbooks:

1. Digital Logic and Computer Design, M. Morris Mano PHI, 1st Edition, ISBN 978-01-32-4510-7
2. Modern Digital Electronics, R. P. Jain 2/e , McGraw Hill
3. Digital Circuits and Design- S. Salivahanan, S. Arivazhagan, 5th Edition Oxford University Press.

Reference books:

1. Digital Systems Principles and Applications, Ronald J. Tocci, Neal S. Widmer, Gregory L. Moss, Pearson Prentice Hall.
2. Digital Design, M. Morris Mano and Michael D. Ciletti, 4th Edition , PHI
3. Fundamental of Digital Circuits- A. ANAND KUMAR, PHI
4. D.Ray Chaudhuri- Digital Circuits-Vol-I & II, 2/e- Platinum Publishers
5. Leach & Malvino—Digital Principles & Application, 5/e, McGraw Hill
6. Floyed & Jain- Digital Fundamentals-Pearson
7. 10.Digital Electronics, As per AICTE: Principles and Integrated Circuits

Online Resources:

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	2	1	3	0	1	1	1	2
CO2	2	2	2	2	2	1	2	0	1	1	1	1
CO3	2	2	2	2	2	1	2	1	1	0	1	1
CO4	1	2	1	1	2	1	2	1	1	1	1	1

Workshop/Seminar/Bootcamp/Hackathon-based Learning

Module Number	Topic	Sub-topics	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment
1	Advanced Applications : AI Hardware & Simulation	Foundations of AI Logic: Mapping machine learning algorithms directly to digital logic gates and arithmetic circuits. Hardware Simulation for AI: Introduction to Hardware Description Languages (HDL) such as Verilog. Simulating custom digital circuits for AI workloads using tools like Xilinx Vivado, Intel Quartus, or open-source simulators (e.g., Verilator). AI Accelerators & TPUs: Architectural overview of Tensor Processing Units, ASICs, and FPGAs.	International Academia: https://online.stanford.edu/courses/ee273-digital-systems-engineering https://ocw.mit.edu/courses/6-111-introductory-digital-systems-laboratory-spring-2006/ AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf Industry Mapping: Xilinx Vivado Design Suite documentation	NA	Online Resource (Coursera): https://www.coursera.org/learn/intro-fpga-design-embedded-systems Workshop/Seminar/Bootcamp/Hackathon is strongly recommended for this module



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B.Tech in Computer Science and Engineering

DETAILED SYLLABUS

Course Code- PCCCS301

Course Title – Data structure & Algorithms

Credit – 3

Category – Professional Core Course

Semester – III

L:T:P:S – 3:0:0:0

Pre-requisite – Introduction to Programming

Course Outcomes:

CO1	Students will be able to acquire and remember the knowledge of fundamental data structures.
CO2	Students will be able to implement any problem by writing their own algorithms.
CO3	Students will be able to analyze the algorithm for a given problem using different data structures.
CO4	Students will be able to learn various data structure approaches and techniques to develop and design projects.

<u>StudyMaterial</u>	<u>Coursera</u>	<u>NPTEL</u>	<u>LinkedIn Learning</u>	<u>InfosysSpringboard</u>
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Module No.	Topic	Sub-topics	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignments	Textbook Mapping
1	Introduction	Why do we need data structure? Concepts of data structures: a) Data and data structure b) Abstract Data Type and Data Type Applications Algorithms and programs. The basic idea of pseudo-code. Algorithm efficiency and analysis. Time and space complexity analysis of algorithms – order notations.	International Academia: <u>https://ocw.mit.edu/courses/6-851-advanced-data-structures-spring-2012/</u> AICTE-prescribed syllabus: <u>https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CS E.pdf</u> Industry Mapping: Various web-based and standalone compilers,	10	1) Write a Program to generate the Armstrong numbers from N to M. 2) Write a Program to print the following sequence of numbers: 0,1,1,2,3,5,8,13, 21,34... 3) Twenty-five numbers are entered from the keyboard. Write a program to find out how many of them	1. Reema Thareja Chapter: 2 2. Debasis Samanta Chapter: 1 3. Aaron M. Tannenbaum Chapter: 1

			Programming practice in Hackerrank, Leetcode, GeeksforGeeks platform.		are positive, how many are negative, how many are even and how many odd. 4) WAP a program to check if a given string is palindrome or not (the user may choose an example string).	
2	Linear Data Structures	Array: Different representations – row-major, column-major [1L]; Sparse matrix - its implementation and usage [1L]; Array representation of polynomials [1L]; Linked List: Singly linked list, circular linked list, doubly linked list, linked list representation of polynomials and applications [2L]; Stack and Queue: Stack and its implementations (using array, using linked	International Academia: https://ocw.mit.edu/courses/6-851-advanced-data-structures-spring-2012/ AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CS%20E.pdf	10	1) Write a program using array where we can find maximum and second maximum number. 2) Write a program to search the location of a given element in array and after searching delete that element from array.	1. Reema Thareja Chapters: 3, 6, 7 and 8 2. Debasis Samanta Chapters: 2, 3 and 4 3. Aaron M. Tannenbaum Chapters: 1, 2, 3 and 4

		list), applications (Infix to Postfix conversion, Evaluation of Postfix expression etc.) [2L]; Queue, circular queue, dequeue [1L]; Implementation of queue- both linear and circular (using array, using linked list), Applications [1L]; Recursion: Principles of recursion – use of the stack, differences between recursion and iteration, tail recursion. Applications - Tower of Hanoi [1L].	Industry Mapping: Various web-based and standalone compilers, Programming practice in Hackerrank, Leetcode, GeeksforGeeks platform.		3) Write a program to perform the push and pop operations in a stack. 4) Write a program for infix to postfix conversion using stack. 5) Write a program for performing the insert and delete operations in a queue. 6) Write a menu driven program for the following operation of a Singly Linked List. A) Insert a node at beginning B) Insert a node as per given position. C) Insert a node at	
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					the end of the linked list. D) Delete a node at beginning E) Delete a node as per given position. F) Delete a node at the last of the linked list. 7) Write a C program to concatenate two doubly linked lists. 8) Write a Program to implement the procedure of Tower of Hanoi using recursion. 9) You are given an array of size N. You can perform an operation in which you will remove the largest and the smallest	
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					elements from the array and you will add their difference at the end of the array. So, finally the array size will be decreased by 1 after each such operation. You are given Q tasks and, in each task, you are given an integer K. For each task, you have to print the sum of all the elements in the array after such k operations. 10) Suppose there is a circle. There are N petrol pumps on that circle. You will be given two sets of data. 1. The amount of petrol that every petrol	
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					pump has. 2. Distance from that petrol pump to the next petrol pump. Find a starting point where the truck can start to get through the complete circle without exhausting its petrol in between. Note: Assume for 1 litre petrol, the truck can go 1 unit of distance.	
3	Nonlinear Data structures	Trees: Basic terminologies, tree representation (using array, using linked list); Binary trees - binary tree traversal (pre-, in-, post-order), recursive and non-recursive traversal algorithms of binary tree, threaded binary tree (left, right, full), and expression tree; Binary search tree-operations (creation, insertion, deletion, searching); Height balanced binary tree –	International Academia: https://ocw.mit.edu/courses/6-851-advanced-data-structures-spring-2012/ AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%	12	1) Write a Program to insert and delete a node from the BST. 2) Write a Program for Tree Traversal in Pre-order. 3) Write a Program for Tree Traversal in In-order.	1. Reema Thareja Chapters: 9 and 13 2. Debasis Samanta Chapters: 7 and 8 3. Aaron M. Tannenbaum

		AVL tree (insertion, deletion with examples only); B- Trees – operations (insertion, deletion with examples only); B+ Trees – operations (insertion, deletion with examples only) [1L]; Graphs: Graph definitions and concepts (directed/undirected graph, weighted/un-weighted edges, subgraph, degree, cut vertex/articulation point, pendant node, clique, complete graph, connected components – strongly connected component, weakly connected component, path, shortest path, and isomorphism); Graph representations / storage implementations – adjacency matrix, adjacency list, adjacency multi-list; Graph traversal and connectivity – Depth-first search (DFS), Breadth-first search (BFS) – concepts of edges used in DFS and BFS (tree-edge, backedge, cross	<u>20-%20UG%20CS E.pdf</u> Industry Mapping: Various web-based and standalone compilers, Programming practice in Hackerrank, Leetcode, GeeksforGeeks platform.		4) Write a Program to implement the Tree Traversal in Post-order. 5) Write a Program to implement the BFS procedure. 6) Write a Program to implement the DFS procedure. 7) Robert lives in a town. He has made some crafts and want to make some money out of it. So he decides to visit every city on the state and sell his crafts. Now there are multiple routes to visit every city in that state and each route has different	Chapters: 5 and 8
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		edge, forward-edge); applications. Minimal spanning tree – Prim’s algorithm, Kruskal’s algorithm (basic idea of greedy methods).			travel fares. Robert knows all the routes and the travel fares. Help Robert to identify a route where he can spend less money while going to each city and returning home. Take the User Input Format as following: N = no of cities in the state fare[][] = 2D matrix showing the fares for each route.	
4	Searching and Sorting	Sorting Algorithms: Bubble sort, insertion sort, shell sort, selection sort, merge sort, quick sort, heap sort (concept of max heap, application – priority queue), radix sort; Time and space complexity derivations; Searching: Sequential search, binary search,	International Academia: https://ocw.mit.edu/courses/6-851-advanced-data-structures-spring-2012/ AICTE-prescribed syllabus:	4	1) You are given a list of n-1 integers in the range from 1 to n. There are no duplicates in the list. One of the integers from 1 to n is missing in the list. Write a program in C	1. Reema Thareja Chapters: 14 and 15 2. Debasis Samanta Chapters: 6 and 10 3. Aaron

		interpolation search. Time and space complexity derivations. Hashing: Hashing functions, collision resolution techniques.	https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf Industry Mapping: Various web-based and standalone compilers, Programming practice in Hackerrank, Leetcode, GeeksforGeeks platform.		to find the missing integers. Note the user input format as: p = size of array a = enter the array elements. 2) A class has “n” number of students. They are standing in a queue and not roll number wise. Write a program in C to let them enter the classroom in a Sorted Manner based on their roll number (in ascending order). Note the User input format as: n = number of students in the queue. a = enter their roll numbers in the array as they are standing (random order).	M. Tannenbaum Chapters: 6 and 7
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Textbooks:

1. Classic Data Structures by Debasis Samanta.
2. Data Structures using C by Aaron M. Tanenbaum.
3. Data Structures using C by Reema Thareja.

Reference books:

1. Data Structures, by Mark Allan Weiss.
2. Introduction to Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein.
3. Data Structures - Schaum – ASE by Seymour Lipschutz.

Workshop/Seminar/Bootcamp/Hackathon based Learning

Topic	Sub-topics		Online Course (NPTEL / Coursera)
LRU / LFU Cache Design	HashMap + Doubly Linked List design; O(1) get/put operations; LRU vs. LFU eviction policies; capacity-based cache design.	Redis – Eviction Policies (allkeys-lru, allkeys-lfu): https://redis.io/docs/latest/develop/reference/eviction/ MIT 6.851 – Advanced Data Structures (Caching & Memory Hierarchy): https://ocw.mit.edu/courses/6-851-advanced-data-structures-spring-2012/	NPTEL – Data Structures & Algorithms (IIT Delhi) https://nptel.ac.in/courses/106102064 Coursera – Data Structures and Performance (University of California San Diego) https://www.coursera.org/learn/data-structures
Skip List	Multi-level linked list; probabilistic balancing; search, insertion and deletion; comparison with balanced trees.	Redis Sorted Set (ZSET) – Internally implemented using Skip Lists: https://redis.io/docs/latest/develop/data-types/sorted-sets/ MIT 6.851 – Advanced Data Structures https://ocw.mit.edu/courses/6-851-advanced-data-structures-spring-2012/	NPTEL – Data Structures & Algorithms (IIT Delhi) (Lecture: Dictionaries – Skip Lists & Hashing) https://nptel.ac.in/courses/106102064 Coursera – Data Structures and Algorithms Specialization (UC San Diego) https://www.coursera.org/specializations/data-structures-algorithms
B+ Tree	Multi-way balanced search tree; insertion & deletion; node split and merge; leaf-level linked list; database indexing; comparison with Binary Search Tree and B-Tree.	MySQL (InnoDB) – Clustered & Secondary Indexes https://dev.mysql.com/doc/refman/5.7/en/innodb-index-types.html PostgreSQL – B-tree Indexes https://www.postgresql.org/docs/17/btree.html Oracle Database – B-tree Indexing https://docs.oracle.com/en/database/oracle/oracle-database/21/admin/managing-indexes.html	Coursera – Database Management Essentials (University of Colorado System) https://www.coursera.org/learn/database-management
Trie (Prefix Tree)	Prefix matching; insertion; deletion; autocomplete; dictionary implementation; longest prefix matching.	Apache Lucene – Term Dictionary & FST (Finite State Transducer) for efficient prefix search and autocomplete (Official Javadocs).	Coursera – Data Structures and Algorithms Specialization (UC San Diego) https://www.coursera.org/specializations/data-structures-algorithms NPTEL – Data Structures & Algorithms (IIT Delhi) https://nptel.ac.in/courses/106102064



University of Engineering & Management, Kolkata
University of Engineering & Management, Jaipur
Institute of Engineering & Management, Kolkata

B.Tech in Computer Science and Engineering

DETAILED SYLLABUS

Course Code- PCCCS381

Course Title – IT Workshop

Credit – 2

Category – Professional Core Course

Semester – III

L:T:P:S – 0:0:0:4

Prerequisite – Basic Mathematics

Course Outcomes:

CO1	Students would be able to understand basic commands, syntax and mathematical operation in MATLAB.
CO2	Students would be able to solve different mathematical problems using matrix operations in MATLAB.
CO3	Students would be able to develop script and function by using complex programming concepts i.e. decision making, looping etc.
CO4	Students would be able to learn data visualization and GUI development in MATLAB.

Study Material	Coursera	NPTEL	LinkedIn Learning	Infosys Springboard
Lesson Plan				

Module number	Topic	Sub-topics	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment
1	Introduction to MATLAB (MATLAB Programming for Engineers, 6E Author(s): Stephen J. Chapman-Chapter 1)	Introduction, Why MATLAB? History, it's strengths, Competitors, Starting MATLAB, Using MATLAB as a calculator, Quitting MATLAB Basics commands in MATLAB, Basic Operations, MATLAB-Data types, Rules about variable names, Predefined variables etc.	International Academia: https://ocw.mit.edu/courses/6-057-introduction-to-matlab-january-iap-2019/pages/syllabus https://stanford.edu/class/cme192/index.html AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf Industry Mapping: https://matlabacademy.mathworks.com/details/matlab-fundamentals/mlbe	4L	• Create One Account in MATLAB Online and Sign In (Use Institutional email e.g. abc@iem.edu.in) Link: https://in.mathworks.com/products/matlab-online.html • Explore MATLAB Layout • Using MATLAB as a Basic Calculator • Variables: create, view, edit, and display • Predefined Variables • Keywords • Operators • Execute Basic Commands: clc, clear all, clear <variable>, close all, quit, help version, who, whos, date, delete, cd, dir, save, load
2	Vector, Matrix, Array, Cell and String Operations (MATLAB Programming for	Vector, Matrix, Array Addressing, Built-in functions, Mathematical Operations, Dealing with strings (Array of characters), Array of array (cell) concept.	International Academia: https://ocw.mit.edu/courses/6-057-introduction-to-matlab-january-iap-2019/pages/syllabus https://stanford.edu/class/cme192/index.html AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf	8L	• User Input: Numeric & String • Vector: create and display • Matrix: create, concatenate, indexing in a matrix (insert, update, and delete), arithmetic operations (addition, subtraction, multiplication, and division) on matrix • String: create, display, concatenation, finding

	Engineers, 6E Author(s): Stephen J. Chapman - Chapter 2, Chapter 9, Chapter 10)		Industry Mapping: https://matlabacademy.mathworks.com/details/matlab-fundamentals/mlbe		length, and string operations (uppercase, lowercase, split, join, unique) Cell Array: create, indexing in cell array (insert, update, and delete), conversion from cell to matrix
3	Script, Function, and Debugging (MATLAB Program for Engineers, 6E Author(s): Stephen J. Chapman - Chapter 1, Chapter 6)	Script file, Input commands, Output commands, Structure of function file, user defined functions, Inline functions, feval command, Comparison between script file and function file, Debugging script.	International Academia: https://ocw.mit.edu/courses/6-057-introduction-to-matlab-january-iap-2019/pages/syllabus https://stanford.edu/class/cme192/index.html AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/ModelCurriculum/AICTE%20-%20UG%20CSE.pdf Industry Mapping: https://matlabacademy.mathworks.com/details/matlab-fundamentals/mlbe	6L	Script: explore script editor, create and execute a script, include multiple sections in a script, and execute separately Function: create and call a function, inline function, feval command Debugging: Debug a MATLAB script and mention all the necessary steps
4	Complex programming and working with dataset (MATLAB Program	Conditional statements and Loop, Relational and Logical Operators, if-else statements, switch-case statements, for loop, while loop, Special	International Academia: https://ocw.mit.edu/courses/6-057-introduction-to-matlab-january-iap-2019/pages/syllabus https://stanford.edu/class/cme192/index.html AICTE-prescribed syllabus: https://www.aicte-	6L	- Problems to explore conditional statements - Problems to explore iteration - Problems to explore recursion Table: create, insert, and delete a column, display and join two tables

	ming for Engineer s, 6E Author(s) : Stephen J. Chapman - Chapter 4, Chapter 5)	commands (break and continue), Table, import data from a large database, Export data to own file or database.	india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf Industry Mapping: https://matlabacademy.mathworks.com/details/matlab-fundamentals/mlbe		Import & Export Files: - Import from a spreadsheet - Export to a spreadsheet - Import from a text file - Export to a text file
5	Data Visualization using MATLAB (MATLAB Program ming for Engineer s, 6E Author(s) : Stephen J. Chapman - Chapter 3, Chapter 8)	2D Plotting: In-built functions for plotting, Multiple plotting with special graphics, Curve fitting, Interpolation, Basic fitting interface. 3D Plotting: Use of meshgrid function, Mesh plot, Surface plot, Plots with special graphics.	International Academia: 1. https://ocw.mit.edu/courses/6-057-introduction-to-matlab-january-iap-2019/pages/syllabus 2. https://stanford.edu/class/cme192/index.html AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf Industry Mapping: https://matlabacademy.mathworks.com/details/matlab-fundamentals/mlbe	6L	2D Plots: - Line plot- multiple lines, line style, color, marker, axis, title, marker - Subplot- changing row and column - Bar plot- categorical, ordering categorical, stacked, color, horizontal - Pie chart- explode, label, legend, color - Histogram plot - Rader plot Polynomial & Curve Fitting: polyval, polyint, polyfit 3D Plots: mesh plot, surface plot, quiver plot
6	Graphical User Interface Design (MATLAB Program ming for	GUI in MATLAB, App designer, Component library (Edit Field, Text Area, Label, Button, Check Box, Drop Down, List	International Academia: https://ocw.mit.edu/courses/6-057-introduction-to-matlab-january-iap-2019/pages/syllabus https://stanford.edu/class/cme192/index.html AICTE-prescribed syllabus: https://www.aicte-	6L	Components and callbacks - Create a simple calculator app - Create an app for student registration data entry using different form components

	Engineers, 6E Author(s): Stephen J. Chapman- Chapter 14)	Box, Button Group, Slider, Spinner etc.), Containers (Panel, Tab Group), Instrumentation, Component browser, Design view and code view, Call back function, Exporting App.	india.org/sites/default/files/ModelCurriculum/AICTE%20-%20UG%20CSE.pdf Industry Mapping: https://in.mathworks.com/academia/courseware/graphic-user-interfaces.html	• Containers and instrumentation • Create an app to display the output in a gauge where input is given by a knob. • Create an app to control light with a switch • MATLAB Project Ideas: https://in.mathworks.com/academia/matlab-engineering-project-ideas.html
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TEXT BOOK:

1. Stephen J. Chapman, “MATLAB Programming for Engineers (6e)”, Cengage.
2. F. Max Coller, “Web Development: Full Stack (1e)”, Cengage.
3. Dawn Griffiths, and David Griffiths, “Head First Android Development (2e)”, O'Reilly.

REFERENCE BOOKS:

1. S. Swapna Kumar and S. V. B. Lenina “MATLAB: Easy Way of Learning”, PHI Learning.
2. C Xavier, “Web Technology & Design”, New Age International Publisher.
3. Pradeep Kothari, “Android Application Development (With Kitkat Support), Black Book”, Dreamtech Press.
- 4.

Workshop/Seminar/Bootcamp/Hackathon based Learning

Module number	Topic	Sub-topics	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment
1	Web Development Basics	Introduction to Web and Internet fundamentals; HTML5: structure, tags, forms, media; CSS3: styling, layouts (Flexbox, Grid); JavaScript basics: variables, functions, DOM manipulation; Responsive design principles; basic client-server architecture, introduction to database connectivity and web hosting concepts.	International Academia: https://xpro.mit.edu/courses/course-v1:xPRO+PCCx+R1/ AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf Industry Mapping: https://full-stack-development.readthedocs.io/en/latest/	NA	Online Resource (Coursera): https://www.coursera.org/learn/fullstack-web-development Workshop/Seminar/Bootcamp/Hackathon is strongly recommended for this module

2	Mobile App Development Basics	Overview of mobile platforms and development tools. Introduction to Android Studio / cross-platform frameworks (Flutter/React Native). UI design using layouts and components. Activity lifecycle, intents, and navigation. Event handling, basic data storage, and deployment of simple mobile applications.	International Academia: https://web.stanford.edu/class/cs47si/#overview AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf Industry Mapping: https://developer.android.com/develop	NA	Online Resource (LinkedIn Learning): https://www.linkedin.com/learning/android-studio-essential-training-14266841/android-studio-and-intellij-idea?u=229219690 Workshop/Seminar/Bootcamp/Hackathon is strongly recommended for this module
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University of Engineering & Management, Kolkata
University of Engineering & Management, Jaipur
Institute of Engineering & Management, Kolkata

B.Tech in Computer Science and Engineering

DETAILED SYLLABUS

Course Code – BSM301

Course Title – Mathematics - III

Credit – 3

Category – Basic Science Course

Semester – III

L:T:P:S – 3:1:0:0

Prerequisite – Permutation & Combination, Concept of Basic Probability, Evaluation of definite, improper and infinite integrals, Concept of β & Γ functions.

Course Outcomes:

CO	Course Outcomes
CO 1	Illustrate the ideas of probability and random variables, various discrete and continuous probability distributions with their properties and their applications in physical and engineering environment that will make a bridge between elementary statistical tools and probability theory.
CO 2	Find the inter-relation between two or more phenomena with the help of curve fitting.
CO 3	Understand the basic components of sampling and have the knowledge on exact sampling distributions which are essential for estimating and testing hypothetical statements. Know the various sampling methodologies and their efficiencies in theoretical and practical aspects.
CO 4	Estimate and test the parameters associated with the relevant areas for forecasting and verification of economic theory
CO 5	Apply the statistical tools in business, economical and commercial areas for analysing problems and to make

	better decisions for future in their fields.
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<u>Study Material</u> (BL 4, 5,6)	<u>Coursera</u>	<u>NPTEL</u>	<u>LinkedIn Learning</u>	<u>Infosys Springboard</u>	<u>Lesson Plan</u> (Page-below)
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Course Objectives:

1. The syllabus will prepare the learners for Engineering Exit Examinations, ESE and campus placements.
2. Students will apply concepts of various probability distributions to find probabilities.
3. Students will make estimations for a mean, variance, standard deviation and proportions for big data.
4. Students will be eligible to work in the Data domain which is the emerging technology of the future and create more opportunities for creative work.
5. Students will be able to describe and quantify the uncertainty inherent in predictions made by machine learning models.

Detailed Syllabus:

Module No.	Topic	Sub-topics	Mapping with Chapters of the Text Book	Mapping with Industry & International Academia	Lecture hour	Corresponding Lab Assignment
1	Random Variables and Probability Distributions	<i>Discrete Random Variable:</i> Discrete Probability Distribution, Expectation and Variance of random variables; Binomial and Poisson Distributions; Mean, Variance and Moment Generating Functions of Binomial and Poisson Variates; Convergence of Binomial to Poisson Variate. <i>Continuous Random Variable;</i> Continuous Probability Distributions, Expectation and Variance of random variables, Exponential, Normal Distributions; Mean, Variance and Moment Generating Functions of the	Chapters 2 and 3/Text Book 1 Chapter 12 /Text Book 2	https://ocw.mit.edu/courses/18-05-introduction-to-probability-and-statistics-spring-2022/	12L	"R" software for statistical computing

		corresponding variates.				
2	Method of Least Squares and Curve Fitting	Principle of Least Squares, Curve fitting by the method of Least Squares - fitting of straight lines, second degree parabolas and exponential curves.	Chapter 9/Text Book 1 Chapter 8/Text Book 2	https://ocw.mit.edu/courses/18-05-introduction-to-probability-and-statistics-spring-2022/	4L	"stata": statistical software for data science
3	Sampling and Sampling Distributions	Population and Sample, Sampling With and Without Replacement (SRSWR and SRSWOR); Random Samples, Population Parameters, Sample Statistics, Sampling Distributions, Standard Error and Probable Error; Sample Mean, Sampling Distribution of Means; Sample Proportion, Sampling Distribution of Proportions, Sample Variances, Sampling Distribution of Variances; Case where Population Variance is unknown; Central Limit Theorem (Statement only); Degrees of freedom, Chi-square distribution, Mean & Variance of Chi-square variate.	Chapter 11/Text Book 1 Chapter 13/Text Book 2	https://www.cl.cam.ac.uk/teaching/2021/IntroProb/materials.html	8L	"stata": statistical software for data science

4	Estimation of Parameters	Point and Interval estimations, Biased and Unbiased estimators, Minimum Variance Unbiased Estimator (MVUE), Consistent Estimator, Maximum Likelihood Estimation of Parameters, Applications in populations following theoretical distributions (Binomial, Poisson and Normal), Calculation of confidence limits for population mean and population proportions.	Chapter 12 /Text Book 1 Chapters 14/ Text Book 2	https://ocw.mit.edu/courses/1-010-uncertainty-in-engineering-fall-2008/	6L	"R" software for statistical computing
5	Testing of Hypothesis	<i>Large Sample Test:</i> Statistical Hypotheses, Test Statistic, Best Critical Region, Test for single mean, difference of means, single proportion, difference of proportions, and difference of standard deviations. <i>Small Sample Test:</i> Test for single mean, difference of means and correlation coefficients, Test for ratio of variances, Chi-square test for goodness of fit and independence of attributes.	Chapter 13/ Text Book 1 Chapter 14/ Text Book 2	https://ocw.mit.edu/courses/6-041-probabilistic-systems-analysis-and-applied-probability-fall-2010/	12L	"R" software for statistical computing

Lesson Plan:

Week-wise Lesson Plan

Course Title: Mathematics – III

Subject Code: BSM301

Duration: 12 Weeks (One Semester) – Mid Term 1: Weeks 1–6, Mid Term 2: Weeks 7–12

Credits: 3

Lecture Hours: 42 (3 Classes per Week, One Module per Class)

Teaching Methods: Lectures, Tutorials, Assignments, Case Studies.

Module Legend

Tag	Module
M1	Module 1: Random Variables and Probability Distributions
M2	Module 2: Method of Least Squares and Curve Fitting
M3	Module 3: Sampling and Sampling Distributions
M4	Module 4: Estimation of Parameters
M5	Module 5: Testing of Hypothesis

Mid Term 1: Weeks 1–6 (Modules 1, 2 and 3 – Parallel Delivery)

Week	Topics	Learning Outcomes
Week 1	Discrete Random Variables: Discrete Probability Distribution, Expectation and Variance of Random Variables Principle of Least Squares; Curve Fitting by Method of Least Squares – Fitting of Straight Lines Population and Sample, SRSWR and SRSWOR, Random Samples, Population Parameters, Sample Statistics	Understand discrete random variables, the least-squares principle, and basic sampling terminology.
Week 2	Binomial Distribution: Mean, Variance and Moment Generating Function of Binomial Variate Curve Fitting – Fitting of Second Degree Parabolas Sampling Distributions, Standard Error and Probable Error	Apply the Binomial distribution and least-squares fitting to parabolic data; understand sampling distributions.
Week 3	Poisson Distribution: Mean, Variance and Moment Generating Function; Convergence of Binomial to Poisson Variate Curve Fitting – Fitting of Exponential Curves (Module 2 concludes) Sample Mean, Sampling Distribution of Means; Sample Proportion, Sampling Distribution of Proportions	Apply the Poisson distribution and its convergence from the Binomial; complete curve fitting techniques; analyze sampling distributions of means and proportions.
Week 4	Continuous Random Variables, Continuous Probability Distributions, Expectation and Variance of Random Variables Problem Solving on Binomial, Poisson Distributions (Module 1) and Curve Fitting (Module 2) Sample Variances, Sampling Distribution of Variances; Case where Population Variance is Unknown	Analyze continuous random variables; consolidate Module 1 and Module 2 problem-solving skills; study sampling distribution of variances.

TEXT BOOKS:

1. **Saktipada Nanda and Sibashis Nanda**, "A Course on Probability & Statistics", 2nd Edition (2024), Mindprobooks Academic Series [Available in flipkart.com/amazon.in]
2. **N. G. Das**, "Statistical Methods", Combined Edition Vol. 1 &2 (2017) McGraw Hill Education

REFERENCE BOOKS:

1. **Sheldon M. Ross**, "Introduction to Probability and Statistics for Engineers and Scientists", 6th Edition (2020), Academic.
2. **Douglas C, Montgomery and George C. Runger**, Applied Statistics and Probability for Engineers, 7th edition (2018), John Wiley & Sons.
3. **Murray R. Spiegel, John J. Schiller and R. Alu Srinivasan**, "Schaum's Outline of Probability & Statistics", 4th Edition (2012), McGraw Hill Education.



University of Engineering & Management, Kolkata
University of Engineering & Management, Jaipur
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B.Tech in Computer Science and Engineering

DETAILED SYLLABUS

Course Code- HSMCS301

Course Title – Humanities - I (Principles of Management)

Credit – 3

Category – Humanities & Social Sciences including Management course

Semester – III

L:T:P:S – 3:0:0:0

Pre-requisite – Basic understanding of Communication.

Course Outcomes:

CO1	Students would gain a thorough grounding in the fundamentals of business management.
CO2	Enabled students to predict corrective business approach and educate detailed process to start up a venture.
CO3	Developed the ability of students to apply current trends in business for better performance.
CO4	The deeper understanding and evaluate the business environment and predict corrective business model for cost effective business performance.

StudyMaterial	Coursera	NPTEL	LinkedIn Learning	InfosysSpringboard
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Module No.	Topic	Sub-topics	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignments	Textbook Mapping
1	Basic concepts of management	Definition–Essence, Functions, Roles, Level. Functions of Management: Planning – Concept, Nature, Types, Analysis, Management by objectives; Organisation Structure – Concept, Structure, Principles, Centralization, Decentralization, Span of Management; Organisational Effectiveness.	International Academia: https://learn.saylor.org/course/BUS208 AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Vol.%20IUG.pdf Industry Mapping: https://www.forbes.com/advisor/business/software/best-erp-systems/	7	Mostly ERP Software: https://www.forbes.com/advisor/business/software/best-erp-systems/	Management: Principles, Processes & Practices – Bhat, A & Kumar, A (OUP). Chapters: 1 and 2
2	Management and Society	Concept, External Environment, CSR, Corporate Governance, Ethical Standards. People Management – Overview,	International Academia: https://learn.saylor.org/course/BUS208	8	Mostly ERP Software: https://www.forbes.com/advisor/business/software/best-erp-systems/	Management: Principles, Processes & Practices – Bhat, A &

		Job design, Recruitment & Selection, Training & Development, Stress Management. Managerial Competencies – Communication, Motivation, Team Effectiveness, Conflict Management, Creativity, Entrepreneurship. Leadership: Concept, Nature, Styles	AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Vol.%20IUG.pdf Industry Mapping: https://www.forbes.com/advisor/business/software/best-erp-systems/		/business/software/best-erp-systems/	Kumar, A (OUP). Chapters: 3 and 4
3	Decision making	Concept, Nature, Process, Tools & techniques. Economic, Financial & Quantitative Analysis – Production, Markets, National Income Accounting, Financial Function & Goals, Financial Statement & Ratio Analysis, Quantitative Methods – Statistical Inference, Forecasting, Regression Analysis, Statistical Quality Control.	International Academia: https://learn.saylor.org/course/BUS208 AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Vol.%20IUG.pdf Industry Mapping: https://www.forbes.com/advisor/business/software/best-erp-systems/	15	Mostly ERP Software: https://www.forbes.com/advisor/business/software/best-erp-systems/	Essentials for Management – Koontz, Revised edition, Tata McGraw Hill (TMH) Chapters: 7, 8 and 9

4	Customer Management	Market Planning & Research, Marketing Mix, Advertising & Brand Management. Operations & Technology Management – Production & Operations Management, Logistics & Supply Chain Management, TQM, Kaizen & Six Sigma, MIS.	International Academia: https://learn.saylor.org/course/BUS208 AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Vol.%20IUG.pdf Industry Mapping: https://www.forbes.com/advisor/business/software/best-erp-systems/	10	Mostly ERP Software: https://www.forbes.com/advisor/business/software/best-erp-systems/	Management: Principles, Processes & Practices – Bhat, A & Kumar, A (OUP). Chapters: 11, 12 and 13
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Textbooks:

Management: Principles, Processes & Practices – Bhat, A & Kumar, A (OUP).

Reference books:

1. Essentials for Management – Koontz, Revised edition, Tata McGraw Hill (TMH)
2. Management – Stoner, James A. F. (Pearson)
3. Management - Ghuman, Tata McGraw Hill (TMH)