# University of Engineering and Management

## Institute of Engineering & Management, Salt Lake Campus

## Institute of Engineering & Management, New Town Campus

## University of Engineering & Management, Jaipur

## 5th Semester Syllabus for B.Tech ECE Admission Batch 2023

# Index:

## Syllabus Structure:

| Sl. No. | Type | Subject Code | Subject Name | L | T | P | Total | Credit |
|---|---|---|---|---|---|---|---|---|
| 1. | CC | PCCECE 501 | Electromagnetic Waves | 3 | 0 | 0 | 3 | 3 |
| 2. | CC | PCCECE 502 | Microprocessor & Microcontroller | 3 | 0 | 0 | 3 | 3 |
| 3. | CC | PCCECE 503 | VLSI Design | 3 | 0 | 0 | 3 | 3 |
| 4. | CC | PCCECE 504 | Data Base Management System | 3 | 0 | 0 | 3 | 3 |
| 4. | ECEL | PECECE 504A | Information Theory & Coding | 3 | 0 | 0 | 3 | 3 |
| 5. | ECEL | PECECE 504B | Industrial Automation I | 3 | 0 | 0 | 3 | 3 |
| 6. | ECEL | PECECE 504C | Cyber Law & Intellectual Property Rights | 3 | 0 | 0 | 3 | 3 |
| 7. | Sessional | OEC581 | Programming in Cloud (Python on AWS) | 3 | 0 | 0 | 3 | 3 |
| 8. | GSC | ESP 502 | ESP V | 1 | 0 | 0 | 1 | 0.5 |
| 9. | GSC | HSM 506 | Economics for Engineers | 2 | 0 | 0 | 2 | 1 |
| 10. | CC | PCCECE 591 | Electromagnetic Waves Laboratory | 0 | 0 | 2 | 2 | 1 |
| 11. | CC | PCCECE 592 | Microprocessor & Microcontroller Laboratory | 0 | 0 | 2 | 2 | 1 |
| 12. | CC | PCCECE 593 | VLSI Design Automation Laboratory | 0 | 0 | 2 | 2 | 1 |
| 13. | GSC | SDP 582 | SDP V | 0 | 0 | 1 | 1 | 0.5 |
| 14. | ECP | PRJECE 581 | Mini Project | - | - | - | 1 | 1 |
| 15. | Mandatory Course | MAR 581 | Mandatory Additional Requirement (MAR) | 0 | 0 | 0 | 0 | 0 |
| 16. | | IFC | Industry and Foreign Certification | 0 | 0 | 0 | 0 | 0 |
| Total Credit Points | | | | | | | **23** | |

# Syllabus for B.Tech Admission Batch 2023

**Subject Name: Electromagnetic Waves** **Credit: 3** **Lecture Hours: 32**

**Subject Code: PCCECE501**

**Pre-requisite:**

## Relevant Links:

Study Material Coursera NPTEL Linkedin Learning

### COURSE OBJECTIVES:

1. To introduce the basic laws of electromagnetism and the basic mathematical concepts related to electromagnetic fields.
2. To impart knowledge on the concepts of electromagnetic waves with corresponding mathematical modelling and its applications.
3. To impart knowledge on the concepts of Transmission Line and Waveguide with respective application and implementation.
4. To impart knowledge on the physical and practical importance basic concepts of Antenna.

## COURSE OUTCOMES:

**CO 1:** Understand the basic laws of electromagnetism and the basic mathematical concepts related to electromagnetic fields.

**CO 2:** Understand the importance of electromagnetic waves with corresponding mathematical modeling.

**CO 3:** Acquire knowledge on Transmission Line and Waveguide with respective application and implementation.

**CO 4:** Understand the physical and practical importance basic concepts of Antenna.

| Module number | Topic | Sub-topics | Mapping with Industry and International Academia | Lecture Hours | Corresponding Lab Assignment |
|---|---|---|---|---|---|
| 1 | **Basic laws of Electromagnetics** | Basics of Vectors, Vector calculus, Basic laws of Electromagnetic: Gauss's law, Ampere's Circuital law, Faraday's law of Electromagnetic induction. Maxwell's Equations. Poynting Vector, Boundary conditions at Media Interface. | ***International Academia:*** (https://ocw.mit.edu/courses/8-311-electromagnetic-theory-spring-2004/pages/syllabus/ )<br><br>***AICTE-prescribed syllabus:*** (https://www.aicte-india.org/sites/default/files/Model_Curriculum/UG-1/ug-vol1.pdf )<br>***Industry Mapping:*** software: Matlab | 6 | ❖ Demonstrate Gauss's law, Ampere's Circuital law, and Faraday's law using MATLAB.<br>❖ Derive Maxwell's Equations and the Poynting Vector using MATLAB. |
| 2 | **Uniform Plane Wave and Plane Waves at Media Interface.** | **A.** Uniform plane wave: homogeneous unbound medium, Wave equation for time harmonic fields, Solution of the wave equation, Uniform plane wave, Wave polarization, Wave propagation in conducting | **International Standards** : (https://ocw.mit.edu/courses/8-311-electromagnetic-theory-spring-2004/pages/syllabus/ ) | 10 | ❖ Utilize MATLAB to Explore Uniform Plane Waves, Wave Polarization, Wave Propagation in Conducting Mediums, Phase Velocity |

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| | | medium, Phase velocity of a wave, Power flow and Poynting vector, Skin Depth.<br><br>**B.** Plane Waves at Media Interface: Plane wave in arbitrary direction, Plane wave at dielectric interface, Reflection and refraction of waves at dielectric interface, Total internal reflection. | ***AICTE prescribed syllabus:*** (https://www.aicte-india.org/sites/default/files/Model_Curriculum/UG-1/ug-vol1.pdf )<br><br>***Industry Mapping:*** Software: Matlab | | Calculation, Power Flow Analysis, Poynting Vector Computation, and Skin Depth.<br>❖ Implement MATLAB Simulations for Plane Waves in Arbitrary Directions, Plane Waves at Dielectric Interfaces, Reflection and Refraction Phenomena at Dielectric Interfaces, and Total Internal Reflection. |
| 3 | **Transmission Lines and Waveguide** | **A.** Transmission Lines: Introduction, Concept of distributed elements, Equations of voltage and current, Standing waves and impedance transformation, Lossless and low-loss transmission lines, Power transfer on a transmission line, Analysis of transmission line in terms of admittances, Transmission line calculations with the help of Smith chart, Applications of transmission line, Impedance matching using transmission lines.<br><br>**B.** Waveguides: Introduction of waveguide, Rectangular waveguides: Analysis of waveguide-general approach, Waveguide modes, Cut-off frequency and Phase velocity. | ***International Standards*** : (https://ocw.mit.edu/courses/8-311-electromagnetic-theory-spring-2004/pages/syllabus/ )<br><br>***AICTE prescribed syllabus:*** (https://www.aicte-india.org/sites/default/files/Model_Curriculum/UG-1/ug-vol1.pdf )<br><br>***Industry Mapping:***<br><br>Hardware: Microwave Bench | 10 | ❖ Plot the Reflection coefficient magnitude for a transmission line with characteristic impedance of 50 ohm and a load impedance varying in the range 0 ohm to 1 Kohm..<br>❖ Plot the Reflection coefficient magnitude and phase for a transmission line with characteristic impedance of 50 ohm and a load |

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| | | | Software: Matlab | | impedance being a Capacitor of capacitance in the range 1pF to 1mF. Consider a frequency of 1 MHz.<br>❖ Plotting of Standing Wave Pattern along a transmission line when the line is open-circuited, short-circuited and terminated by a resistive load at the loadend.<br>❖ Input Impedance measurement of a terminated waveguide using shift in minima technique.<br>❖ Smith chart and its application for unknown impedance measurement.<br>❖ Determination of phase and group velocities in a waveguide carrying TE10 Wave from |

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| | | | | | Dispersion diagram [ω−β Plot]. |
| 4 | **Antennas:** | Radiation parameters of antenna, Potential functions, Solution for potential functions, Radiations from Hertz dipole, Total power radiated by a dipole, Radiation resistance and radiation pattern of Hertz dipole.<br>Overview of Horn Antenna, Yagi-Uda Antenna, Dipole antenna, Folded Dipole Antenna, Microstrip Patch antenna. | ***International Standards:***<br>(https://ocw.mit.edu/courses/8-311-electromagnetic-theory-spring-2004/pages/syllabus/ )<br><br>***AICTE prescribed syllabus:***<br>(https://www.aicte-india.org/sites/default/files/Model_Curricul um/UG-1/ug-vol1.pdf )<br><br>***Industry Mapping:***<br><br>Hardware: Yagi - Uda Antenna, Horn | 6 | ❖ Measurement of Radiation Pattern of simple Dipole Antenna.<br>❖ Measurement of Radiation Pattern of Folded Dipole Antenna.<br>❖ Measurement of Radiation Pattern of Yagi - Uda Antenna.<br>❖ Introduction and Measurement of Radiation Pattern of Pyramidal Horn Antenna.<br>❖ Study of Spectrum Analyzer.<br>❖ Design Rectangular Waveguide in CST/ HFSS. |

*Submitted by Dr. Rintu Kumar Gayen, Dept. of ECE, IEM, Kolkata, Salt Lake Campus

## Text Books

1. Elements of Electromagnetics, 4th Edition, Matthew O H Sadiku, Oxford University Press.
2. Electromagnetic Field Theory & Transmission Lines, G.S.N. Raju, Pearson Education
3. Electromagnetic Waves Shevgaonkar, Tata-McGaw-Hillr –R K

## Reference Books

1. Engineering Electromagnetics, 2ed Edition - Nathan Ida, Springer India
2. Fields & Waves in Communication Electronics, S. Ramo, J. R. Whinnery & T. Van Duzer, John Wiley
3. Electromagnetic Theory & Applications, A. K. Saxena, Narosa Publishing House Pvt. Ltd.
4. Electromagnetics, 2ed Edition – J A Edminister, Tata-McGraw-Hill.
5. Engineering Electromagnetics, 7thEdition-W.H.Hayt & J.A.Buck, Tata-McGraw-Hill.
6. Electromagnetic Waves and Transmission Lines- by G.Prasad, J.Prasad and J.Reddy-

## Syllabus for B.Tech Admission Batch 2023

**Subject Name: VLSI Design** **Credit: 3** **Lecture Hours: 48**

**Subject Code: PCCECE503**

**Pre-requisite:** Electronic Devices, Analog Electronic Circuits, Digital Electronic Circuits.

**Relevant Links:**

| Study Material | Coursera | NPTEL | Linkedin Learning | Infosys Springboard |
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## COURSE OBJECTIVES:

1. To learn about basic CMOS circuits both in analog and digital domain
2. To learn about VLSI physical design automation
3. To learn the concepts of designing VLSI subsystems.

## COURSE OUTCOMES:

**CO 1:** Know the different IC fabrication steps.

**CO 2:** Know how to design different CMOS analog circuits based on their specifications.
**CO 3:** Know how to design different CMOS digital circuits using various logic families.
**CO 4:** Know the different algorithms behind VLSI physical design.

| Module number | Topic | Sub-topics | Mapping with Industry and International Academia | Lecture Hours | Corresponding Lab Assignment |
|---|---|---|---|---|---|
| **1** | **Device Physics & IC Fabrication Steps** | MOS device physics and modeling; Wafer processing; oxidation; epitaxy; Diffusion & Ion implantation; Photolithography; Etching; Basic n-well process; p-well process; twin tub process; Layout and stick diagram. | ***International Academia:*** (https://ocw.mit.edu/courses/6-374-analysis-and-design-of-digital-integrated-circuits-fall-2003/pages/readings/)<br>(https://coursera.org/learn/vlsi-cad-layout)<br>(https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01384303323145011229272_shared/overview)<br>(https://www.coursera.org/learn/mosfet)<br>***AICTE-prescribed syllabus:*** (https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_ECE.pdf )<br>***Industry Mapping:***<br>**Language:** T Spice, H Spice, LT Spice, VHDL/Verilog<br>**Software:** Cadence, Tanner EDA Tool, Xilinx ISE, Silvaco TCAD<br>**Hardware:** FPGA Development Board ( Spartan 6/ Artix-7) | 12 | 1. MOSFET Device characteristics simulation in Silvaco TCAD<br>2. Simulating oxidation process step in Silvaco TCAD<br>3. Simulating epitaxy process step in Silvaco TCAD<br>4. Simulating diffusion & ion implantation process steps in Silvaco TCAD<br>5. Simulating photolithography process step in Silvaco TCAD<br>6. Simulating etching process step in Silvaco TCAD<br>7. Doing basic layout of different standard cells in Cadence |

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| **2** | **Digital CMOS Design** | Inverter characteristics; Combinational circuit design: CMOS logic families including static, dynamic, and dual rail logic; Sequential circuit design: design of latches and flip-flops; Delay in digital circuits: RC delay model, linear delay model, logical path efforts; Basic concept of SRAM, DRAM and ROM. | **International Standards**: (https://ocw.mit.edu/courses/6-374-analysis-and-design-of-digital-integrated-circuits-fall-2003/pages/readings/)<br>(https://coursera.org/learn/vlsi-cad-logic)<br>(https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013843033231450112292 72_shared/overview)<br><br>***AICTE prescribed syllabus:*** (https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_ECE.pdf)<br><br>***Industry Mapping:***<br>**Language:** T Spice, H Spice, LT Spice, VHDL/Verilog<br>**Software:** Cadence, Tanner EDA Tool, Xilinx ISE<br>**Hardware:** FPGA Development Board ( Spartan 6/ Artix-7) | 12 | 1. CMOS inverter transfer charactersitics simulation in Cadence<br>2. Design of basic gates in Xilinx ISE in all programming styles<br>3. Design of adder/subtractor in Xilinx ISE in all programming styles<br>4. Design of multiplier/ divider in Xilinx ISE in all programming styles<br>5. Design of registers and latches in Xilinx ISE<br>6. Design of counters (synchronous and asynchronous) in Xilinx ISE<br>7. **Project :** Design of any complex digital architecture using the basic building blocks in Xilinx ISE |
| **3** | **Analog CMOS Design** | Single stage amplifiers; Differential amplifiers; Active loads; Current mirrors; Current and voltage references; Switched capacitor circuits. | ***International Standards*** : (https://ocw.mit.edu/courses/6-012-microelectronic-devices-and-circuits-fall-2005/pages/lecture-notes/)<br>(https://www.coursera.org/learn/mosfet)<br>(https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013843033231450112292 72_shared/overview)<br><br>***AICTE prescribed syllabus:*** (https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_ECE.pdf)<br><br>***Industry Mapping:***<br>**Language:** T Spice, H Spice, LT Spice, VHDL/Verilog<br>**Software:** Cadence, Tanner EDA Tool, Xilinx ISE<br>**Hardware:** FPGA Development Board ( Spartan 6/ Artix-7) | 12 | 1. Design of single stage amplifiers (CS, CD, CG) in Cadence<br>2. Design of differential amplifiers in Cadence<br>3. Design of amplifiers with different active loads in Cadence<br>4. Design of basic and cascode current mirror in Cadence<br>5. Design of different current and voltage references in Cadence<br>6. Design of switched capacitor circuits and circuits for discrete time signal processing in Cadence<br>7. **Project :** Design of any complex analog circuit using the basic building blocks in Cadence |

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| **4** | **VLSI Design Automation** | Compaction, Placement, Floor planning and Routing Problems, Concepts and Algorithms, Physical Design cycle for FPGA's partitioning and routing for segmented and staggered models | ***International Standards:*** (https://ocw.mit.edu/courses/6-111-introductory-digital-systems-laboratory-fall-2002/resources/fpga/)<br><br>***AICTE prescribed syllabus:*** (https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_ECE.pdf) (https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01384303323145011229272_shared/overview)<br><br>***Industry Mapping:***<br>**Language:** T Spice, H Spice, LT Spice, VHDL/Verilog<br>**Software:** Cadence, Tanner EDA Tool, Xilinx ISE, MATLAB<br>**Hardware:** FPGA Development Board ( Spartan 6/ Artix-7) | 12 | 1. Implementing the basic compaction algorithms in MATLAB<br>2. Implementing the basic placement algorithms in MATLAB<br>3. Implementing the basic floorplanning algorithms in MATLAB<br>4. Implementing the basic local routing algorithms in MATLAB<br>5. Implementing the basic global routing algorithms in MATLAB |

## TEXT BOOK:


1. S.M.Sze, VLSI Technology, 2nd Ed, McGraw Hill Education
2. S. Mo. Kang and Y. Leblebici, CMOS Digital Integrated Circuits: Analysis & Design, 3rd Ed, Tata McGraw Hill, 2003
3. P. Allen and D. Holberg, CMOS Analog Circuit Design, 2nd Ed, Oxford University Press, 2002
4. Naveed Sherwani, Algorithms for VLSI Physical Design Automation, 3rd Ed, Springer International Edition


## REFERENCE BOOKS:


1. N.H.E. Weste and D.M. Harris, CMOS VLSI Design: A Circuits and Systems Perspective, 4th Ed, Pearson Education India, 2011
2. C. Mead and L. Conway, Introduction to VLSI Systems, Addison Wesley, 1979
3. J. Rabaey, Digital Integrated Circuits: A Design Perspective, Prentice Hall India, 1997
4. B. Razavi, Design of Analog CMOS Integrated Circuits, Tata McGraw Hill, 2002
5. P. Douglas, VHDL: programming by example, McGraw Hill, 2013
6. S.H.Gerez, "Algorithms for VLSI Design Automation," John Wiley 1999

# Syllabus for B.Tech Admission Batch 2023

**Subject Name: Information Theory & Coding** **Credit: 3** **Lecture Hours: 36**
**Subject Code: PECECE504A**

**Pre-requisite:**

## Relevant Links:

Study Material Coursera NPTEL Linkedin Learning

### COURSE OBJECTIVES:

1. To introduce the basic concepts of information theory.
2. To give the idea of various coding theories and the importance of all of them in information systems in communication engineering.
3. To understand the theoretical background for implementing error-control codes.
4. To visualize the role of Cryptography in Information Security.

## COURSE OUTCOMES:

**CO1:** Calculate information, entropy, mutual information, and channel capacity for various channels.

**CO2:** Implement the various types of source coding algorithms and analyze their performance.

**CO3:** Explain various methods for generating and detecting different error-correcting codes, BCH and RS Codes and the decoding techniques.

**CO4:** Understand the basics of cryptography and implement different algorithms for Information security.

| Module number | Topic | Sub-topics | Mapping with Industry and International Academia | Book Name | Lecture Hours | Corresponding Lab Assignment |
|---|---|---|---|---|---|---|
| **1** | **Information Theory:** | Basics of information theory – Entropy, Information rate, classification of codes, Kraft McMillan inequality, Source coding theorem, Shannon-Fano coding, Huffman coding, Extended Huffman coding, uniquely detectable codes, Joint and conditional entropies, Mutual information – Discrete memoryless channels – BSC, BEC – Channel capacity, Shannon limit. | ***International Academia:*** (https://ocw.mit.edu/courses/6-441-information-theory-spring-2016/pages/syllabus/)<br><br>***AICTE-prescribed syllabus:*** (https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_ECE.pdf)<br><br>***Industry Mapping:***<br>MATLAB | R. Bose, Information Theory Coding and Cryptography, Tata McGraw Hill<br>Chapter 1 and 2 | 8 | 1. Discuss the relationship between joint entropy and mutual information.<br>2. Explain how channel capacity is related to the maximum rate of reliable communication over a noisy channel.<br>3. How does increasing the signal-to-noise ratio (SNR) affect the channel capacity?<br>4. Compare and contrast the Binary Symmetric Channel (BSC) and Binary Erasure Channel (BEC) in terms of their error characteristics and reliability. |
| **2** | **Error Control Coding: Block Codes** | Definitions and Principles: Hamming weight, Hamming distance, Minimum distance decoding – Single parity codes, | ***International Academia:*** (https://ocw.mit.edu/courses/6-441-information-theory-spring-2016/pages/syllabus/) | Sanjay Sharma, Comm | 8 | 1. Provide an example illustrating how Hamming distance is calculated and used to correct errors in a Hamming code. |

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| | | Hamming codes, Repetition codes – Linear block codes, Cyclic codes – Syndrome calculation, Encoder and decoder – CRC Techniques of coding and decoding of Cyclic codes. | ***AICTE prescribed syllabus:*** (https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_ECE.pdf)<br><br>***Industry Mapping:*** MATLAB | unication Systems, S K Kataria & Sons<br>Chapter 16 | | 2. Discuss scenarios where repetition codes or single parity codes are preferred over more complex coding schemes.<br>3. Provide an example of a cyclic code and explain the process of syndrome calculation for error detection.<br>4. Illustrate the operation of a cyclic code encoder and decoder with a specific example. |
| **3** | **Error Control Coding: Convolutional Codes** | Convolutional codes – code tree, trellis, state diagram – Encoding – Decoding: Sequential search and Viterbi algorithm – Principle of Turbo coding. | ***International Academia:*** (https://ocw.mit.edu/courses/6-441-information-theory-spring-2016/pages/syllabus/)<br>***AICTE prescribed syllabus:*** (https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_ECE.pdf)<br><br>***Industry Mapping:*** MATLAB | Sanjay Sharma, Communication Systems, S K Kataria & Sons<br>Chapter 16 | 8 | 1. Describe the structure of a convolutional encoder and how it generates codewords based on input data.<br>2. Provide an example of encoding a data sequence using a specific convolutional code and illustrate the resulting codeword generation.<br>3. Explain the concept of traceback and path metric computation in the context of the Viterbi algorithm.<br>4. Explain the concept of iterative decoding in Turbo coding and how it improves error-correction performance. |
| **4** | **BCH codes** | Algebraic Description, Frequency Domain Description, Decoding Algorithms for BCH and RS Codes. | ***International Academia:*** https://web.stanford.edu/class/ee376a/outline.html<br><br>***AICTE prescribed syllabus:*** (https://www.aicte- | P.K. Ghosh, K. Gupta, Principles of | 6 | 1. Provide an example of constructing a BCH code with a specific generator polynomial and demonstrate the decoding process using syndromes. |

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| | | | india.org/sites/defaul t/files/Model_Curriculum/Final_E CE.pdf)<br><br>***Industry Mapping:***<br>MATLAB | Error Correcting Code, Platinum publisher<br>Chapter 4 | | 2. Illustrate an RS code's encoding and decoding process in the frequency domain with a numerical example.<br>3. Provide a detailed example demonstrating the error correction process for an RS code using one of the decoding algorithms.<br>4. When selecting BCH and RS codes for specific applications, analyze the trade-offs between complexity and error-correcting capability. |
| **5** | **Cryptography** | Symmetric Cryptosystems: Substitution permutation networks DES and Enhancements – AES and its Modes. Asymmetric Key Cryptography: Basic Ideas of Asymmetric Key Cryptography – RSA Cryptosystem. | ***AICTE prescribed syllabus:*** (https://www.aicte-india.org/sites/defaul t/files/Model_Curriculum/Final_E CE.pdf)<br><br>***Industry Mapping:***<br>Data shark. academy | Behrouz A. Forouzan, Data Communications and Networking, Fifth edition, Published by McGraw-Hill<br>Chapter-31 | 6 | 1. Discuss common enhancements to DES, such as Triple DES (3DES) and its application in increasing security.<br>2. Illustrate how AES encryption operates in a specific mode and discuss the security implications of different modes.<br>3. Analyze the performance characteristics of symmetric and asymmetric encryption algorithms regarding speed, key size, and resistance to various cryptographic attacks.<br>4. Investigate recent advancements in symmetric and asymmetric encryption techniques, such as authenticated and homomorphic encryption modes. |

## TEXT BOOK:


1. 1 R. Bose, Information Theory Coding and Cryptography, Tata McGraw Hill
2. Sanjay Sharma, Communication Systems, S K Kataria & Sons, 4th edition.
3. Behrouz A. Forouzan, Data Communications and Networking, Fifth edition, Published by McGraw-Hill


## REFERENCE BOOKS:


1. 1 M. Kulkarni, K.S.Shivaprakasha., Information Theory and Coding, Wiley
2. P.K. Ghosh, K. Gupta, Principles of Error Correcting Code, Platinum publisher
3. A Practical Guide to Error-Control Coding Using MATLAB®, Yuan Jiang, © 2010 Artech House.
4. Christof Paar · Jan Pelzl, Understanding Cryptography, Springer.

# Syllabus for B.Tech Admission Batch 2023

**Subject Name: Database Management Systems Credit: 3 Lecture Hours: 36**

**Subject Code: OECEC505A**

**Pre-requisite:** Data Structure & Algorithm, Computer Architecture & Organisation.

## Relevant Links:

Study Material Coursera NPTEL Linkedin Learning

## COURSE OBJECTIVES:

1. 1. To understand the different issues involved in the design and implementation of a database system.
2. To study the physical and logical database designs, database modelling, relational, hierarchical, and network models.
3. To understand and use data manipulation language to query, update, and manage a database.
4. To develop an understanding of essential DBMS concepts such as: database security, integrity, and concurrency.
5. To design and build a simple database system and demonstrate competence with the fundamental tasks involved with modelling, designing, and implementing a DBS.

## COURSE OUTCOMES:

**CO1:** **Remember** different aspects of a database management system.

**CO2:** **Understand** different issues involved in the design and implementation of a database system.

**CO3:** **Apply** the knowledge of a database system for writing queries, normalizing a database, applying techniques to serialize transaction schedules in concurrent or parallel databases.

**CO4:** **: Analyze & Evaluate** a database architecture, query methods suitable to it, finding suitability of normalization degrees, storage strategies, analyzing the performance of a concurrency control scheme and suitability of the security technique pertaining to the use cases of the database and also **designing** of a new architectural model for a simple database system and demonstrate competence with the fundamental tasks involved in modelling, designing and implementing a DBMS.

| Module number | Topic | Sub-topics | Mapping with Industry and International Academia | Lecture Hours | Corresponding Lab Assignment |
|---|---|---|---|---|---|
| **1a** | **Database System Architecture** | Concepts & overview of Database Management System, Data abstraction, Data independenc Data Definition Language (DDL), Data Manipulation Language (DML). | **International Academia:** https://online.stanford.edu/courses/soe-ydatabases0005-databases-relational-databases-and-sql<br><br>**AICTE-prescribed syllabus:** chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf<br><br>**Industry Mapping:**<br><br>*Relax Relational algebra calculator:* https://dbis-uibk.github.io/relax/landing<br><br>SQL: PostgreSQL/MySQL/Maria DB, or SQLite in browser<br><br>B+-tree visualization: https://www.cs.usfca.edu/~gall | 3 | Write SQL query to create schema & table.<br>Write SQL query manipulate data. |

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| | | | es/visualization/BPlusTree.html<br><br>Various DB systems playground: https://www.pdbmbook.com/playground | | |
| **1b** | **Data Models** | Entity-relationship model, design Issues, mapping constraints, keys, Entity-Relationship diagram, integrity constraints, data manipulation operations. Network model, Relational and Object oriented data models | **International Academia:** https://online.stanford.edu/courses/soe-ydatabases0005-databases-relational-databases-and-sql<br><br>**AICTE-prescribed syllabus:** chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf<br><br>**Industry Mapping:**<br><br>*Relax Relational algebra calculator:* https://dbis- | **6** | Write SQL query to learn different keys. |

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| | | | uibk.github.io/relax/landing<br><br>SQL: PostgreSQL/MySQL/Maria DB, or SQLite in browser<br><br>B+-tree visualization: https://www.cs.usfca.edu/~galles/visualization/BPlusTree.html<br><br>Various DB systems playground: https://www.pdbmbook.com/playground | | |
| **2a** | **Relational Query Languages** | Relational algebra, Tuple and domain relational calculus, SQL3, DDL and DML constructs, Open source and Commercial DBMS MYSQL,ORACLE, DB2, SQL server. | **International Academia:** https://online.stanford.edu/courses/soe-ydatabases0005-databases-relational-databases-and-sql<br><br>**AICTE-prescribed syllabus:** chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf<br><br>**Industry Mapping:** | **5** | Write SQL query to create schema and create/alter/delete/truncate table.<br>Write SQL query select/insert/update /delete/merge data. |

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| | | | *Relax Relational algebra calculator:* https://dbis-uibk.github.io/relax/landing<br><br>SQL: PostgreSQL/MySQL/Maria DB, or SQLite in browser<br><br>B+-tree visualization: https://www.cs.usfca.edu/~galles/visualization/BPlusTree.html<br><br>Various DB systems playground: https://www.pdbmbook.com/playground | | |
| **2b** | **Relational Database Design** | Domain and data dependency, Armstrong's axioms, Normal forms, Dependency preservation, Lossless design. | **International Academia:** https://online.stanford.edu/courses/soe-ydatabases0005-databases-relational-databases-and-sql<br><br>**AICTE-prescribed syllabus:** chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20- | **3** | Write SQL query for different Normalization. |

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| | | | %20UG%20CSE.pdf<br><br>**Industry Mapping:**<br><br>*Relax Relational algebra calculator:* https://dbis-uibk.github.io/relax/landing<br><br>SQL: PostgreSQL/MySQL/MariaDB, or SQLite in browser<br><br>B+-tree visualization: https://www.cs.usfca.edu/~galles/visualization/BPlusTree.html<br><br>Various DB systems playground: https://www.pdbmbook.com/playground | | |

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| **2c** | **Query Processing and Optimization** | Evaluation of relational algebra expressions,<br>Query equivalence, Join strategies,<br>Query optimization algorithms. | **International Academia:**<br>https://online.stanford.edu/courses/soe-ydatabases0005-databases-relational-databases-and-sql<br><br>**AICTE-prescribed syllabus:**<br>chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf<br><br>**Industry Mapping:**<br><br>*Relax Relational algebra calculator:* https://dbis-uibk.github.io/relax/landing<br><br>SQL: PostgreSQL/MySQL/Maria DB, or SQLite in browser<br><br>B+-tree visualization: https://www.cs.usfca.edu/~galles/visualization/BPlusTree.html<br><br>Various DB systems playground: | **6** | Write SQL query using Query optimization approach.<br>Write SQL query for different types of Joining. |

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| | | | https://www.pdbmbook.com/playground | | |
| **3** | **Storage Strategies** | Indices, B-trees, hashing | **International Academia:** https://online.stanford.edu/courses/soe-ydatabases0005-databases-relational-databases-and-sql<br><br>**AICTE-prescribed syllabus:** chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf<br><br>**Industry Mapping:**<br><br>*Relax Relational algebra calculator:* https://dbis- | **3** | NA |

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| | | | uibk.github.io/relax/landing<br><br>SQL: PostgreSQL/MySQL/Maria DB, or SQLite in browser<br><br>B+-tree visualization: https://www.cs.usfca.edu/~galles/visualization/BPlusTree.html<br><br>Various DB systems playground: https://www.pdbmbook.com/playground | | |
| **4** | **Transaction Processing** | Concurrency control, ACID properties, Serializability of scheduling, Locking and timestamp based schedulers, Multi-version and optimistic Concurrency control schemes, Database recover | **International Academia:** https://online.stanford.edu/courses/soe-ydatabases0005-databases-relational-databases-and-sql<br><br>**AICTE-prescribed syllabus:** chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf<br><br>**Industry Mapping:** | **7** | NA |

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| | | | *Relax Relational algebra calculator:* https://dbis-uibk.github.io/relax/landing<br><br>SQL: PostgreSQL/MySQL/MariaDB, or SQLite in browser<br><br>B+-tree visualization: https://www.cs.usfca.edu/~galles/visualization/BPlusTree.html<br><br>Various DB systems playground: https://www.pdbmbook.com/playground | | |

## TEXT BOOK:

1. Database System Concepts, by Abraham Silberschatz, Henry F. Korth, S. Sudarshan, McGraw-Hill, 6th Edition.

## REFERENCE BOOKS:


1. Fundamentals of Database Systems, by R. Elmasri and S. Navathe, Pearson Education, 5th Edition.
2. Database Management Systems by R. Ramakrishnan and Johannes Gehrke, McGraw Hill Education, 3rd Ed.

**Syllabus for B.Tech Admission Batch 2023**

**Subject Name: Programming in Cloud (Python on AWS)** **Credit: 3** **Lecture Hours: 36**

**Subject Code: OEC581**

**Pre-requisite:**

**Relevant Links:**

Coursera NPTEL Linkedin Learning

**COURSE OBJECTIVES:**

1. Understand the necessary theoretical background for computing and storage cloudsenvironments.
2. Know the methodologies and technologies for the development of applications that will be deployed and offeredthrough different cloud computing environments.
3. Ability to comprehend, design, and develop cloud system using some state-of-the-art platform.
4. Cloud computing security architectural issues, Identity management and Autonomic security.

*COURSE OUTCOMES:*

**CO 1:** Articulate the main concepts, key technologies, strengths, limitations of cloud computing and the possible applications for state-of-the-art cloud computing.
**CO2:** Identify the architecture and infrastructure of cloud computing, including cloud delivery and deployment models.
**CO3:** Analyze the core issues of cloud computing such as security, privacy, and interoperability. Build, deploy, and manage Python-based applications on AWS using services like Boto3, Lambda, DynamoDB, and Flask/Django frameworks.

| Module number | Topic | Sub-topics | Mapping with Industry and International Academia | Lecture Hours | Corresponding Lab Assignment |
|---|---|---|---|---|---|
| 1 | **Cloud Computing Fundamentals, Resource Management and Load Balancing** | Introduction: Distributed Computing and Enabling Technologies, Cloud Fundamentals: Cloud Definition, Evolution, Architecture, Applications, deployment models, and service models. Virtualization: Issues with virtualization, virtualization technologies and architectures, Internals of virtual machine monitors/hypervisors, virtualization of data centers, and Issues with Multi-tenancy. Resource Management and Load Balancing: Distributed Management of Virtual Infrastructures, Server consolidation, Dynamic provisioning and resource management, Resource Optimization, Resource dynamic reconfiguration, Scheduling Techniques for Advance Reservation, Capacity Management to meet | T1<br>Chapter 1 – 4<br><br>***Internation al***<br><br>***Academia:*** (https://web. stanford.edu /class/cs349 d/ )<br><br>***AICTE-prescribed syllabus:*** (https://ww w.aicte-india.org/sit es/default/fi les/Model_Cur riculum/AI CTE%20-%20UG%20 CSE.pdf ) | 6 | ❖ Implementation of Para-Virtualization using VM Ware‘s Workstation/ Oracle‘s Virtual Box and Guest O.S. |

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| | | SLA Requirements, and Load Balancing, various load balancing techniques | ***Industry Mapping:*** Amazon, Microsoft, Google | | |
| 2 | **Cloud Services** | Implementation: Study of Cloud computing Systems like Amazon EC2 and S3, Google App Engine, and Microsoft Azure, Build Private/Hybrid Cloud using open source tools, Deployment of Web Services from Inside and Outside a Cloud Architecture. MapReduce and its extensions to Cloud Computing, HDFS, and GFS.<br><br><RDS, Aurora DB, DynamoDB, Serverless, Lambda, Cloud Formation, Elastic Beanstalk and CloudWatch are not included > | T1<br>Chapter 9<br>**International Standards**<br><br>https://web.st anford.edu/cl ass/cs349d/ ) ***AICTE prescribed syllabus:*** (https://ww w.aicte-india.org/si tes/default/ files/ Model_Cu rriculum/A ICTE %20- %20UG%20 CSE.pdf ) ***Industry Mapping:*** Amazon | 12 | 1. Demonstrate and implement IAAS service using AWS (Use t2.Micro) (Free tier eligible) (instance only).<br>2. Demonstrate and implement Storage as a service using AWS S3 Service.<br>3. Demonstrate and implement PaaS that is Deploy static Website using AWS S3 Service.<br>4. Deploy web applications on commercial cloud or create simple word press app using Light sail service in AWS (SAAS).<br>5. Understand Security of Web Server and |

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| | | | | | demonstration of IAM using own cloud/AWS. |

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| 3 | **Storage – Simple Storage Service (S3)** | Introduction to AWS Storage Pre-S3 – online cloud storage API, S3 consistency models Storage hierarchy, buckets in S3 Objects in S3, metadata and storage classes, object versioning, object lifecycle management, cross-region replication, data encryption, connecting using VPC endpoint, S3 pricing. | (Book: Wadia, Wiley 2017) | 6 | |

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| 4 | **AWS on Python** | Interacting with AWS using Python (Boto3)<br><br>Boto3 Basics:<br><br>Installing Boto3.<br><br>Connecting to AWS using credentials.<br><br>Understanding the Boto3 client and resource models.<br><br>Working with AWS Services: S3:<br><br>Uploading, downloading,<br>listing objects, managing buckets. EC2:<br>Launching instances, managing instances, working with security groups.<br><br>Lambda: Creating and deploying functions, invoking functions.<br><br>DynamoDB: Creating tables, adding data, querying data.<br><br>IAM: Managing users, roles, and policies.<br><br>Building Python Applications on AWS:<br><br>Integrating various AWS services.<br>Building simple web applications using Flask or Django and AWS. | (Book: Garnaat, Wiley 2011) | 12 | ❖ Deploy web applications on commercial cloud or create simple word press app using Light sail service in AWS (SAAS). |

*TEXT BOOKS:*

T1. Mastering Cloud Computing by Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, McGraw Hill Education (India) Private Limited, 2013.
T2. Barrie Sosinsky, “Cloud Computing Bible” John Wiley & Sons, 2010 T3. Introduction to IoT by Sudip Mishra, Cambridge University Press.

- Garnaat, M., 2011. Python and AWS cookbook. " O'Reilly Media, Inc**.**
- Wadia, Y. and Gupta, U., 2017. Mastering AWS Lambda. Packt Publishing Ltd**.**

*REFERENCE BOOKS:*

1. P. K. Pattnaik, M. R. Kabat and S. Pal, Fundamentals of Cloud Computing, Vikas Publishing House Pvt. Ltd., 2015.
2. Cloud computing a practical approach - Anthony T.Velte , Toby J. Velte Robert Elsenpeter, TATA McGraw-Hill , New Delhi – 2010 •
3. Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online - Michael Miller - Que 2008

Internet of Things: Architecture, Design Principles And Applications, Rajkamal, McGraw Hill Higher Educatio