



**TKR COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)**

(Sponsored by TKR Educational Society, Approved by AICTE, Affiliated by JNTUH,
Accredited by NBA & NAAC with 'A' Grade)



B.TECH. ELECTRONICS & COMMUNICATION ENGINEERING PCB DESIGN B.Tech III Semester(2021-22)

Prerequisite: Knowledge of analog and digital circuits.

Course Objectives:

1. Understand the need for PCB Design and steps involved in PCB Design and Fabrication process.
2. Familiarize Schematic and layout design flow using Electronic Design Automation (EDA) Tools.

Course Outcomes: Upon completing this course, the student will be able to

1. Appreciate the necessity and evolution of PCB, types and classes of PCB.
2. Understand the steps involved in schematic, layout, fabrication and assembly process of PCB design.
3. Understand basic concepts of Electronic Design Automation (EDA) Tools.
4. Design (schematic and layout) PCB for analog circuits, digital circuits and mixed circuits.
5. Design (schematic and layout) and fabricate PCB for simple circuits.

List of Experiments:

PART A: Tutorials and Practice Exercises

1. **Introduction to PCB Installation Guide:** Definition and Need/Relevance of PCB, Background and History of PCB, Types of PCB, Classes of PCB Design, Terminology in PCB Design, Different Electronic design automation (EDA) tools and comparison
2. **PCB Design Process:** PCB Design Flow, Placement and routing, Steps involved in layout design, Artwork generation Methods - manual and CAD, General design factor for digital and analog circuits, Layout and Artwork making for Single-side, double-side and Multilayer Boards, Design for manufacturability, Design-specification standards
3. **Introduction to PCB Fabrication & Assembly:** Steps involved in fabrication of PCB, PCB Fabrication techniques-single, double sided and multilayer, Etching: chemical principles and mechanisms, Post operations- stripping, black oxide coating and solder masking, PCB component assembly processes
4. **Using any Electronic design automation (EDA) software, Practice PCB Design steps:**
Example circuit: Basic RC Circuit
 - Schematic Design: Familiarization of the Schematic Editor, Schematic creation, Annotation, Netlist generation
 - Layout Design: Familiarization of Footprint Editor, Mapping of components, Creation of PCB layout Schematic
 - Create new schematic components
 - Create new component footprints

PART B: Design PCB (schematic and Layout) for following exercises.

1. Regulator circuit using 7805.
2. Inverting Amplifier and Non-Inverting Amplifier
3. Full-wave Rectifier
4. Astable or Monostable multivibrator using IC555
5. RC Phase-shift or Wein-bridge Oscillator using transistor

PART C: Fabricate single-side PCB for simple network

1. Fabricate single-sided PCB, mount the components and assemble in a cabinet for any one of the circuits mentioned in Part-B.

References

1. Printed Circuit Board by RS Khandpur, Tata McGraw Hill Education Pvt Ltd., New Delhi.
2. Electronic Product Design Volume-I by S D Mehta, S Chand Publications.
3. Open source EDA Tool KiCad Tutorial: <http://kicad-pcb.org/help/tutorials>
4. Fabrication user guide page: <http://www.wikihow.com/Create-Printed-Circuit-Boards> ,
http://www.siongboon.com/projects/2005-09-07_home_pcb_fabrication/ ,
http://reprap.org/wiki/MakePCBInstructions#Making_PCBs_yourself
5. PCB Fabrication at home(video): <https://www.youtube.com/watch?v=mv7Y0A9YeUc>,
<https://www.youtube.com/watch?v=imQTCW1yWkg>



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**B.TECH – ELECTRONICS & COMMUNICATION ENGINEERING
B.Tech IV Semester(2022-23)**

5G EMERGING TECHNOLOGIES

Course Objectives:

- Knowledge on the concepts of 5G and 5G technology drivers.
- Knowledge on 5G network architecture, components.
- Knowledge on Transmission and Design Techniques for 5G
- Knowledge on types of communication devices.
- Knowledge on millimeter wave communication.

Course Outcomes:

- Understand 5G and 5G Broadband Wireless Communications.
- Understand 5G wireless Propagation Channels.
- Understand the significance of transmission and Design Techniques for 5G.
- Analyze Device-to-device (D2D) and machine-to-machine (M2M) type communications.
- Learn Massive MIMO propagation channel models.

MODULE- I:

Introduction on 5G technology, Overview of 5G Broadband Wireless Communications: Evolution of mobile technologies 1G to 4G (LTE, LTEA, LTEA Pro), An Overview of 5G requirements, Regulations for 5G, Spectrum Analysis and Sharing for 5G.

MODULE - II:

The 5G wireless Propagation Channels: Channel modeling requirements, propagation scenarios and challenges in the 5G modeling, Channel Models for mm Wave MIMO Systems., 3GPP standards for 5G

MODULE - III:

Transmission and Design Techniques for 5G: Basic requirements of transmission over 5G, Modulation Techniques – Orthogonal frequency division multiplexing (OFDM), generalized frequency division multiplexing (GFDM), filter bank multi-carriers (FBMC) and universal filtered multi-carrier (UFMC), Multiple Accesses Techniques – orthogonal frequency division multiple accesses (OFDMA), generalized frequency division multiple accesses (GFDMA), non-orthogonal multiple accesses (NOMA).

MODULE - IV:

Device-to-device (D2D) and machine-to-machine (M2M) type communications – Extension of 4G D2D standardization to 5G, radio resource management for mobile broadband D2D, multi-hop and multi- operator D2D communications.

MODULE V:

Millimeter-wave Communications – spectrum regulations, deployment scenarios, beam-forming, physical layer techniques, interference and mobility management, Massive MIMO propagation channel models, Channel Estimation in Massive MIMO, Massive MIMO with Imperfect CSI, Multi-Cell Massive MIMO, Pilot Contamination, Spatial Modulation (SM).

TEXT BOOKS:

1. Martin Sauter “From GSM From GSM to LTE–Advanced Pro and 5G: An Introduction to Mobile Networks and Mobile Broadband”, Wiley-Blackwell.
2. Afif Osseiran, Jose. F. Monserrat, Patrick Marsch, “Fundamentals of 5G Mobile Networks”, Cambridge University Press.

REFERENCE BOOKS:

1. Jonathan Rodriguez, “Fundamentals of 5G Mobile Networks”, John Wiley & Sons.
2. Amitabha Ghosh and Rapeepat Ratasuk “Essentials of LTE and LTE-A”, Cambridge University Press.
3. Athanasios G.Kanatos, Konstantina S.Nikita, Panagiotis Mathiopoulos, “New Directions in Wireless Communication Systems from Mobile to 5G”, CRC Press.
4. Theodore S. Rappaport, Robert W. Heath, Robert C. Danials, James N. Murdock “MillimeterWave Wireless Communications”, Prentice Hall Communications



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ELECTRONICS & COMMUNICATION ENGINEERING B.Tech IV Semester(2022-23)

Critical Thinking

Course Objective:

own critical thinking, i.e., scrutinizing the assumptions, reasoning, and evidence
what is needed to teach or guide .

Course Outcomes:

- Understand key concepts of critical thinking
- Clarify the difference in cognition, reasoning and logics
- Improve their **decision making** based on facts, assumptions, arguments etc.
- Able to see a problem with a logical approach to find a quick solution
- Understand the importance of bias in critical thinking

UNIT I: INTRODUCTION- Critical Thinking

- What are the types of thinking?
- What is critical thinking?
- Importance of critical thinking

UNIT II : Cognitive Thinking

- Definition of Cognition
- How does your Brain Work?
- Evolution of Human Brain
- Left Brain Vs Right Brain
- Importance of Cognition in Critical Thinking
- Limitation of Cognition

UNIT III: Reasoning

- What is reasoning?
- Importance of Reasoning in Decision Making
- Impact of Reasoning in Critical Thinking
- Is reasoning always correct?
- Fallacious Reasoning
- Good and Bad Reasoning
- Limitations of Reasoning

UNIT IV: Logical Thinking

- What is logic?
- Importance of Thinking Logically
- Inductive Reasoning
- Deductive Reasoning
- Impact of Logics in Critical Thinking

UNIT V: Statements and Arguments

- What is a Statement?
- What is the Argument?
- Understanding Assumption
- Texts and Materials Readings for the course consist of
 - a) articles and book chapters that can be downloaded from password protected page;
 - b) work read as part of CEs, which, with planning, can be borrowed from libraries. riting.



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**B.TECH – ELECTRONICS & COMMUNICATION ENGINEERING
B.Tech VI Semester(2021-22)**

Machine Learning Using Python

Course Objective:

To be able to formulate machine learning problems corresponding to different applications using Python

Course Outcomes:

After completion of this course, the candidate will be able to :

1. How to install python software and IDEs
2. Gain knowledge in the area of machine learning

UNIT-I: Introduction to Python:

Python Installation with various IDE's 4.1 Python data Types 4.2 Control Structure 4.3 Functions. Data Analysis & visualization –using numpy, panda matplotlib, scipy etc.

UNIT-II :Introduction to Machine Learning:

Applications of Machine Learning Supervised vs Unsupervised Learning Python libraries suitable for Machine Learning

UNIT-III:Regression

Linear Regression, Multiple Linear Regression , Polynomial Regression Support Vector Regression, Decision Tree Regression, Random Forest Regression .

UNIT-IV:Classification

K-Nearest Neighbour, Decision Trees, Logistic Regression, Support Vector Machines

UNITV:Supervised & Unsupervised Learning

K-Means Clustering, Hierarchical Clustering, Density-Based Clustering