Dr. Babasaheb Ambedkar Technological University
(Established as a University of Technology in the State of Maharashtra)
(Under Maharashtra Act No. XXIX of 2014)
P.O. Lonere, Dist. Raigad, Pin 402 103, Maharashtra
Telephone and Fax. 02140 - 275142
www.dbatu.ac.in

Structure and Detailed Syllabus

for UG Degree

Minor in 5G and Advanced Technology

in line with New Education Policy 2020

(Effective from Academic year 2025-26 for Affiliated Colleges Only)

Bucket for Minor in Electronics Engineering

Offered by

Electronics & Communication(Advanced Communication Technology)

Case I: B. Tech degree with Minor in Electronics Engineering (160-176 credits)

The Bachelor's Engineering Degree in chosen Engg./ Tech. Discipline with multidisciplinary minor (min.160-max.176 Credits) i.e. "**B. Tech in chosen Engg./ Tech. Discipline with Minor in 5G and Advanced Technology**" (160-176 credits) enables students to take up four-six or required additional courses of 14 credits in the discipline other than **chosen Engg./ Tech. Discipline** distributed over semesters III to VIII.

Case II: Bachelor's Engineering Degree in chosen Engg./ Tech. Discipline with Double Minor (Multidisciplinary and Specialization Minor 180-194 credits)

The **Bachelor's Engineering Degree in chosen Engg./ Tech. Discipline with Double Minor** (Multidisciplinary and Specialization Minor, 180-194 credits), i.e. "**B. Tech in chosen Engg./ Tech. Discipline with minor in *other selected discipline in* Engineering (as MDM) with Specialization Minor in 5G and Advanced Technology**" (180-194 credits) enables students to take up four-six additional courses of 14 credits in the discipline other than **chosen Engg./ Tech. Discipline** (for completion of multidisciplinary minor) and 18 to 20 extra credits in the **5G and Advanced Technology** distributed over semesters III to VIII. Here, the ***other selected discipline* in Engineering should be different from Specialization Minor i.e. 5G and Advanced Technology**. This enables students to take up four-six or required additional courses of 18 to 20 credits in the discipline of **5G and Advanced Technology Engineering** distributed over semesters III to VIII, which are over and above the min.160-max.176 Credits. The decision regarding the mechanism of distribution of these 18-20 credits over semesters III to VIII, prescribed for the duration of four years will be taken by respective BoS. **Student must have CGPA equal to or greater than 7.5 at the end of second semester to go for this option**.

List of Courses for

Minor in 5G and Advanced Technology

Sr. No.	Course Category	Course Code	Course Title	Teaching Scheme			Evaluation Scheme				Credit
				L	T	P	CA	MSE	ESE	Total	
1	SEM-III	25AF1928MD306	Electronic Devices & Circuits	2	0	0	20	20	60	100	2
2	SEM-IV	25AF1928MD406	Analog and Digital Communication	2	0	0	20	20	60	100	2
3	SEM-V	25AF1928MD506	Wireless Communication	3	0	0	20	20	60	100	3
4	SEM-VI	25AF1928MD605	Optical Fiber Communication	3	0	0	20	20	60	100	3
5	SEM-VII	25AF1928MD705	5G Technology	2	0	0	20	20	60	100	2
6	SEM-VIII	25AF1928MD802	Mobile Communication	2	0	0	20	20	60	100	2
										600	**14**

Second Year (Semester –III)
Electronic Devices & Circuits

25AF1928MD306	**Electronic Devices &Circuits**	**MDM**	**2L- 0T - 0P**	**2 Credits**

Teaching Scheme	**Examination Scheme**
Lecture: 2 hrs./week	Continuous Assessment : 20 Marks Mid Semester Exam: 20 Marks End Semester Exam: 60 Marks (Duration 03 hrs.)

Pre-Requisites: Basic Semiconductor theory.

Course Objectives:

1	To acquaint the students with construction, theory and characteristics of various electronic Devices.
2	To emphasis on design of basic electronic circuits.
3	To impart knowledge of working principles of Op-amp & its applications.
4	To study various op-amp parameters and their significance for Op-Amp
5	To emphasize the features and advantages of integrated circuits.

Course Outcomes:

On completion of the course, students will be able to:

CO1	Discuss operation, biasing and applications of BJT, JFET & MOSFET.
CO2	Compare the characteristics and parameters of MOSFET towards its DC circuits.
CO3	Understand the basic concepts related to Op-amp
CO4	Understand the characteristics Op-Amp and identify the internal structure.
CO5	Analyze and identify linear and nonlinear applications of Op-Amp.

Course Contents:

Unit No 1:	**Bipolar Junction Transistor**	**[6 Hours]**
BJT: construction, working, characteristics, Transistor as switch, Transistor configurations, Current gain equation, stability factor. **BJT Biasing and basic amplifier configurations:** Need for biasing BJT, Transistor biasing methods, Transistor as amplifier.		
Unit No 2:	**Junction Field Effect Transistor and MOSFET**	**[6 Hours]**
FET-Introduction to JFET, Types, Construction, Operation, Static Characteristics, Pinch off voltage, FET Volt-Ampere characteristics, FET Configurations (CS/CD/CG) and their Comparison. FET Amplifier. **MOSFET**- Basics of MOS Transistor operation, Construction of n-channel E-MOSFET, E- MOSFET characteristics & parameters.		

Unit No 3:	Operational Amplifier	[5 Hours]
Block diagram of Op-Amp, differential amplifier configurations using BJT, constant current source, level shifting, transfer characteristics, frequency response, study of ICuA741, Op-Amp parameters, Inverting and non-inverting amplifiers.		
Unit No 4:	**Linear and Non-linear applications of Op-Amp**	**[7 Hours]**
Linear Applications:Summing, differential amplifier, integrator and differentiator and instrumentation amplifiers.Wein bridge oscillator using IC 741. Converters using OP-AMP :V-F, I-V and V-I converter. Non Linear Applications:Theory & Design of Op-amp IC 741 based comparator, Schmitt trigger, astable multivibrator as square and triangular wave generator.		
Unit No 5:	**Active Filters and PLL**	**[6Hours]**
Active filters and PLL Design guidelines of Active filters: Low pass, high pass, band pass and band stop filters, block diagram of PLL and its function		

Text Books

1.	Boylestad & Nashelsky, Electronics Devices & Circuits, Pearson Education
2.	Millman Halkias, ―Integrated Electronics-Analog and Digital Circuits and Systems‖, Tata McGraw Hill, 2000.
3.	Ramakant A. Gaikwad, "Op Amps and Linear Integrated Circuits", Pearson Education 2000
4.	E.S. Yang, Microelectronic Devices, McGraw Hill, Singapore, 1988.

Reference Books

1.	D. A. Neamen, Semiconductor Physics and Devices (IRWIN), TMH Education Group, Chicago) 1997
2.	Salivahanan and Kanchana Bhaskaran, "Linear Integrated Circuits", Tata McGraw Hill, India 2008.
3.	George Clayton and Steve Winder, "Operational Amplifiers", 5th Edition

Second Year (Semester –IV)
Analog & Digital Communication

25AF1928MD406	Analog & Digital Communication	MDM	2L- 0T - 0P	2Credits

Teaching Scheme	Examination Scheme
Lecture:2 hrs./week	Continuous Assessment : 20 Marks Mid Semester Exam: 20 Marks End Semester Exam: 60 Marks (Duration 03 hrs.)

Pre-Requisites:

Course Objectives:

1	To introduce the concepts of analog communication systems.
2	To equip students with various issues related to analog communication such as modulation, demodulation, transmitters and receivers and noise performance
3	To understand the process of signal transmission through analog communication channels, including the effects of noise, attenuation, and distortion, and methods to mitigate these effects.
4	To understand the building blocks of digital communication system.
5	To prepare mathematical background for communication signal analysis.

Course Outcomes: At the end of course, students should:

CO1	Understand and identify the fundamental concepts and various components of analog Communication systems.
CO2	Understand the concepts of modulation and demodulation techniques.
CO3	Design circuits to generate modulated and demodulated wave.
CO4	Understand the block diagram of digital communication system.
CO5	Analyse the performance of a baseband and pass band digital communication system in terms of error rate and spectral efficiency

Course Contents:

Unit No 1:	**Introduction to Communication System**	**[6 Hours]**
Block schematic of communication system, Simplex and duplex systems, Modes of communication: Broadcast and point to point communication, Necessity of modulation, Classification of modulation, sampling theorem and pulse analog modulation, multiplexing: TDM, FDM.		
Unit No 2:	**Amplitude Modulation**	**[6 Hours]**

Introduction, Mathematical analysis and expression for AM, Modulation index, Frequency spectrum and bandwidth of AM, Power calculations, Generation of AM using nonlinear property, Low and high level modulation, Balance Modulator. **Types of AM:** DSB-FC, DSB-SC, SSB-SC, ISB and VSB, their generation methods and comparison.		
Unit No 3:	**Angle Modulation**	**[6 Hours]**
Introduction, Mathematical analysis of FM and PM, Modulation index for FM and PM, Frequency spectrum and bandwidth of FM, Narrow band and wide band FM, Direct and indirect methods of FM generation, Pre emphasis and de-emphasis, Comparison of AM, FM and PM. PAM		
Unit No 4:	**Digital Transmission of Analog Signal**	**[6 Hours]**
Introduction to Digital Communication System: Block Diagram and transformations, basic Digital Communication Nomenclature. Digital Versus Analog Performance Criteria, Sampling Process, PCM Generation and Reconstruction, Quantization Noise, Non-uniform Quantization and Companding, PCM with noise: Decoding noise, Error threshold, Delta Modulation, ASK,FSK and PSK.		
Unit No 5:	**Baseband Digital Transmissions**	**[6 Hours]**
Digital Multiplexing: Multiplexers and hierarchies, Data Multiplexers. Data formats and their spectra, synchronization: Bit Synchronization, Scramblers, Frame Synchronization. Intersymbol interference, Equalization		

Text Books

1	Kennedy, "Electronics Communications Systems", McGraw-Hill New Delhi-1997, 4th Edition.
2	Anokh Singh, "Principles of communication engineering"S.Chand
3	Simon Haykin, “Digital Communication Systems”, John Wiley & Sons, Fourth Edition.
4	A.B Carlson, P B Crully, J C Rutledge, “Communication Systems”, Fourth Edition, McGraw Hill Publication.
5	Ha Nguyen, Ed Shwedyk, “A First Course in Digital Communication”, Cambridge University Press.

Reference Books

1	Wayne Tomasi, "Electronic Communication Systems", Pearson Education-2005, 5th Edition.
2	Beasley & Miller, "Modern Electronic Communication", Prentice-Hall India-2006, 8th Edition
3	B P Lathi, Zhi Ding “Modern Analog and Digital Communication System”, Oxford University Press, Fourth Edition.
4	Bernard Sklar, Prabitra Kumar Ray, “Digital Communications Fundamentals and Applications” Second Edition, Pearson Education.
5	Taub, Schilling, “Principles of Communication System”, Fourth Edition, McGrawHill.
6	P Ramkrishna Rao, Digital Communication, Mc Graw Hill Publication