



KAMALDNP

kamaldnp.com • IT Training, Varanasi

PDF created by Raj Kamal using AI

Microwave and Radar — Complete Syllabus (Program Elective-1, Option 2)

BTEUP Diploma in Electronics Engineering • 5th Semester • Session 2026-27

Subject 5.2.2 — Program Elective-1, Option 2 (Theory) • Total 100 Marks • 3 Credits • L 3

- P 0 • Choose this OR Control System & PLC OR Digital Communication Systems

Examination Scheme

Code	Paper	Type	L - P	Credits	Internal	External	Total
5.2.2	Program Elective-1: Microwave and Radar	Theory	3 - 0	3	Theory 40	Theory 60 (3 hrs)	100
Microwave and Radar Total				3	40	60	100

What This Subject Aims To Do

To enhance the technical skills of diploma engineers in the operation, maintenance and troubleshooting of microwave and RADAR-based telecommunication systems — microwave communication being the backbone of terrestrial communication and fundamental to mobile communication systems.

Unit-Wise Complete Topic List

Unit	Topic	Periods	Marks Share
1	Fundamentals of Microwave Communication	4	10%
2	Introduction to Microwave Devices	14	33%

3	Wave Guides	8	19%
4	Radar Systems	8	19%
5	Satellite Communication	8	19%

Unit 1 — Fundamentals of Microwave Communication (4 Periods, 10%)

Topics: History, Microwave frequency spectrum, band designations and applications of microwave in various fields, Simple block diagram of microwave transmitter, receiver and microwave link repeater. Types of propagation- Ground wave, Sky Wave and Space Wave. Introduction to Transmission Lines, their types and applications.

In simple words: Microwaves: their frequency bands and uses, how signals propagate (ground, sky and space waves), and the basic transmitter-receiver link.

Unit 2 — Introduction to Microwave Devices (14 Periods, 33%)

Topics: Microwave Passive Devices: Directional Coupler, Power Divider, Attenuator, Resonator. Microwave vacuum tube devices: Construction working, specifications and applications of two cavity Klystron amplifier, Reflex Klystron, Magnetron and Helix TWT. Compare the performance of Klystron, Magnetron and TWT. Microwave semiconductor devices: Construction, working, specifications, characteristics and applications of Gunn diode. IMPATT diode. Tunnel diode, PIN diode

In simple words: The devices that generate and handle microwaves: passive components, vacuum tubes (klystron, magnetron, travelling-wave tube) and semiconductor devices (Gunn, IMPATT, tunnel and PIN diodes).

Unit 3 — Wave Guides (8 Periods, 19%)

Topics: Types of Waveguides, and Propagation of waves in rectangular and circular waveguides and their applications. Advantages and disadvantages of rectangular and circular wave guides. Modes of wave guide; Propagation constant of a rectangular wave guide, cut off wavelength, guide wavelength and their relationship with free space wavelength (no mathematical derivation). Impossibility of TEM mode in a wave guide. Comparison of wave guide with Transmission line and comparison of rectangular waveguide with circular waveguide.

In simple words: Waveguides — hollow pipes that carry microwaves: their modes, cut-off wavelength, and why the TEM mode cannot exist inside one.

Unit 4 — Radar Systems (8 Periods, 19%)

Topics: Introduction to RADAR Fundamentals: Basic block diagram of RADAR system, RADAR performance factors: RADAR range equation, factors influencing range, effect of noise. Types of RADAR Systems: Basic pulse RADAR system: Block diagram and description, applications. Doppler Effect, CW Doppler RADAR: Block diagram, operation and application. FM CW RADAR: Block diagram. Operation and application. MTI: Block diagram, operation concept of blind speed, application. Automatic target detection RADAR, SONAR system: Working principle and applications.

In simple words: Radar: how it detects targets and measures range, pulse radar, Doppler radar, FM-CW radar, moving-target indication, and sonar.

Unit 5 — Satellite Communication (8 Periods, 19%)

Topics: Introduction. Advantages & disadvantages of satellite system. Frequency bands, uplink & downlink frequencies. Kepler's First Law. Kepler's Second Law. Kepler's Third Law. Definitions of Terms for Earth-Orbiting Satellites. Orbital Elements. Apogee and Perigee Heights. Orbit Perturbations, Effects of a non-spherical earth. Atmospheric drag. Satellite angles, satellite repeaters. Station keeping. attitude control. satellite positioning. LEO, MEO, GEO satellite overview. Satellite communication system. Transponders. Crosslink, Satellite frequency allocation and frequency reuse. Block diagram of satellite earth station.

In simple words: Satellites: Kepler's laws, orbits (LEO, MEO, GEO), transponders, frequency reuse, and the earth station that talks to them.

Reference Books (as listed in the syllabus)

- RADAR systems and radio aids to navigation Sen, A. K. and Bhattacharya, A. B. Mercury Learning information. PVT.LTD. New Delhi, 2017.
- Microwave Engineering, Das, Annapurna and Das, S. K. Mc Graw Hill, New Delhi (3rd edition)
- Microwave Engineering, Gupta, Sanjeev, Khanna publication 2015 New Delhi
- Microwave and RADAR Engineering, Gautam, A. K., S.K. Kataria Publication New Delhi.
- Microwave and RADAR Engineering, Kulkarni, M. Umesh Publications, New Delhi, 2009.

KAMALDNP • kamaldnp.com • support@kamaldnp.com • +91 8318013442 • Varanasi, UP

Source: BTEUP 3rd Year curriculum (folder2627), approved in C.D.C. meeting held on 16.07.2026. Topic lists follow the official syllabus; short explanations are the author's own plain-English summaries, not syllabus text. Please confirm with your own polytechnic for any local changes.