

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

COURSE PLAN – PART I			
Name of the programme and specialization	B.TECH. ELECTRONICS AND COMMUNICATION ENGINEERING		
Course Title	MICROWAVE ELECTRONICS		
Course Code	ECPC29	No. of Credits	03
Course Code of Pre-requisite subject(s)	ECPC25		
Session	July 2018	Section (if, applicable)	A / ✓ B
Name of Faculty	Dr. R. K. JEYACHITRA	Department	Electronics and Communication Engineering
Email	jeyachitra@nitt.edu	Telephone No.	0431-2503320
Name of Course Coordinator(s) (if, applicable)	NONE		
E-mail	NIL	Telephone No.	NIL
Course Type	<input checked="" type="checkbox"/> Core course	<input type="checkbox"/> Elective course	
Syllabus (approved in BoS)			
Course Content			
<p>Limitations of conventional vacuum tubes, Klystrons: Reentrant cavities, Two cavity klystron, Velocity modulation process, Bunching process, Power output and efficiency; Multi-cavity klystron, Reflex klystron-Velocity modulation process, Mode Characteristics, Electronic admittance spiral.</p> <p>Travelling-wave tubes: Slow-wave structures, Helix TWT- Amplification process, Convection current, Wave modes and gain; Coupled cavity TWT, Backward wave oscillator.</p> <p>Crossed -field devices: Magnetrons- Principle of operation, characteristics, Hull cut-off condition; Carcinotron, Gyrotron.</p> <p>Microwave transistors and FETs: Microwave bipolar transistors-Physical structures, characteristics, Power-frequency limitations; Microwave tunnel diode, Microwave unipolar transistor – Physical structure, principle of operation, characteristics, High electron-mobility transistors.</p> <p>Transferred electron and Avalanche transit-time devices: Gunn diode, Gunn diode as an oscillator. IMPATT, TRAPATT and BARITT.</p>			

Text Books

1. S.Y.Liao, "Microwave Devices and Circuits (3/e)", PHI, 2005.
2. R. F. Soohoo, "Microwave Electronics", Wesley publication, 1971.

Reference Books

1. R.E.Collin, "Foundations for Microwave Engineering (2/e)", Wiley India, 2007
2. D.M.Pozar, "Microwave Engineering (3/e)", Wiley India, 2009.
3. K C Gupta, Indian Institute of Technology, Kanpur, "Microwaves", Wiley Eastern Limited, 1995.

COURSE OBJECTIVES

- To impart knowledge on basics of microwave electron beam devices and their applications in X band frequency.

COURSE OUTCOMES (CO)

Course Outcomes	Aligned Programme Outcomes (PO)
At the end of the course student will be able	
1. Apply the basic knowledge of waveguide and microwave resonator circuits.	PO1, PO2 and PO3
2. Asses the methods used for generation and amplification of the microwave power.	PO1, PO2, PO3, PO5 and PO12
3. Distinguish between the linear and cross field electron beam microwave tubes.	PO1, PO2, PO3, PO4 and PO12
4. Critically analyze the operating principles and performances of the microwave semiconductor devices.	PO1, PO2, PO3, PO4 and PO12
5. Identify the suitable microwave power sources of given specification for the selected application.	PO2, PO3, PO4 and PO12
6. Aware of current technological changes in the engineering aspects of microwave components.	PO2, PO3 and PO4

COURSE PLAN – PART II**COURSE OVERVIEW**

This course introduces the concept of conventional vacuum tubes, Klystrons, and Travelling-wave tubes. Students will get the exposure of Crossed -field devices, Microwave transistors and FETs. Emphasis the configuration of Transferred electron and Avalanche transit-time devices.

COURSE TEACHING AND LEARNING ACTIVITIES

S.No.	Week/Contact Hours	Topic	Mode of Delivery
1	1 st WEEK 9 th to 13 th July (3 Contact Hours)	Introduction to conventional vacuum tubes, Klystrons	Lecture C&T/ PPT or Any suitable mode

2	2 nd WEEK 16 th to 20 th July (3 Contact Hours)	Reentrant cavities, Two cavity klystron, Velocity modulation process, Bunching process, Power output and efficiency	Lecture C&T/ PPT or Any suitable mode
3	3 rd WEEK 23 rd to 27 th July (3 Contact Hours)	Multi-cavity klystron, Reflex klystron- Velocity modulation process, Mode Characteristics, Electronic admittance spiral	
4	4 th WEEK 30 th July to 3 rd August (3 Contact Hours)	Introduction to Travelling-wave tubes and Slow-wave structures	
5	5 th WEEK 6 th to 10 th August (3 Contact Hours)	Helix TWT- Amplification process, Convection current, Wave modes and gain	
6	6 th WEEK 13 th to 17 th August (3 Contact Hours)	Coupled cavity TWT, Backward wave oscillator	
		ASSESSMENT I – 20 MARKS	WRITTEN TEST
7	7 th WEEK 20 th to 24 th August (3 Contact Hours)	Introduction to Crossed -field devices	Lecture C&T/ PPT or Any suitable mode
		ASSESSMENT II – 5 MARKS	ASSIGNMENT-1
8	8 th WEEK 27 th to 31 st August (3 Contact Hours)	Magnetrons- Principle of operation, characteristics, Hull cut-off condition, Carcinotron, Gyrotron.	Lecture C&T/ PPT or Any suitable mode
9	9 th WEEK 3 rd to 7 th September (3 Contact Hours)	Introduction to Microwave transistors and FETs- Microwave bipolar transistors-Physical structures, characteristics, Power-frequency limitations	
10	10 th WEEK 10 th to 14 th September (3 Contact Hours)	Microwave tunnel diode, Microwave unipolar transistor – Physical structure, principle of operation, characteristics, High electron-mobility transistors	
		ASSESSMENT III – 20 MARKS	WRITTEN TEST
11	11 th WEEK 17 th to 21 st September (3 Contact Hours)	Introduction to Transferred electron and Avalanche transit-time devices	Lecture C&T/ PPT or Any suitable mode

12	12 th WEEK 24 th to 28 th September (3 Contact Hours)	Gunn diode, Gunn diode as an oscillator	Lecture C&T/ PPT or Any suitable mode
		ASSESSMENT IV – 5 MARKS	ASSIGNMENT-2
13	13 th WEEK 1 st to 5 th October (3 Contact Hours)	IMPATT, TRAPATT and BARITT	Lecture C&T/ PPT or Any suitable mode

C & T - Chalk and Talk

PPT - Power Point

COURSE ASSESSMENT METHODS (shall range from 4 to 6)

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	ASSESSMENT I WRITTEN TEST (UNIT 1 & 2)	3 rd Week of August	60 Minutes	20
2	ASSESSMENT II ASSIGNMENT-1	4 th Week of August	5 days	5
3	ASSESSMENT III WRITTEN TEST (UNIT 3 & 4)	3 rd Week of September	60 Minutes	20
4	ASSESSMENT IV ASSIGNMENT-2	5 th Week of September	5 days	5
CPA	COMPENSATION ASSESSMENT* (WRITTEN TEST)	3 th Week of October	60 Minutes	Please refer course policy for more details
5	FINAL ASSESSMENT* ALL UNITS (WRITTEN TEST)	2 nd Week of November	180 Minutes	50

***mandatory; refer to guidelines on page 4**

COURSE EXIT SURVEY (mention the ways in which the feedback about the course shall be assessed)

- Feedback from the students during class committee meetings.
- Individual subject feedback through MIS website at the end of the semester.

COURSE POLICY (preferred mode of correspondence with students, compensation assessment policy to be specified)

MODE OF CORRESPONDENCE (email/ phone etc)

1. All the students are advised to check their NITT WEBMAIL regularly. All the correspondence (schedule of classes/ schedule of assessment/ any other information regarding this course) will be done through their webmail only.
2. Queries (if required) to the course teacher shall only be emailed to the email id specified by the teacher.

COMPENSATION ASSESSMENT POLICY

1. If any student is not able to attend any of the continuous assessments descriptive examination due to genuine reason, the student is permitted to attend the compensation assessment (CPA) with 20% weightage.
2. At any case, CPA will not be considered as an improvement test.

ATTENDANCE POLICY (A uniform attendance policy as specified below shall be followed)

- At least 75% attendance in each course is mandatory.
- A maximum of 10% shall be allowed under On Duty (OD) category.
- Students with less than 65% of attendance shall be prevented from writing the final assessment and shall be awarded 'V' grade.

ACADEMIC DISHONESTY & PLAGIARISM

- Possessing a mobile phone, carrying bits of paper, talking to other students, copying from others during an assessment will be treated as punishable dishonesty.
- Zero mark to be awarded for the offenders. For copying from another student, both students get the same penalty of zero mark.
- The departmental disciplinary committee including the course faculty member, PAC chairperson and the HoD, as members shall verify the facts of the malpractice and award the punishment if the student is found guilty. The report shall be submitted to the Academic office.

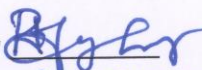
The above policy against academic dishonesty shall be applicable for all the programmes.

ADDITIONAL INFORMATION

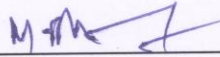
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FOR APPROVAL

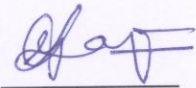
Course Faculty


(Dr. R. K. JAYACHITRA)

CC-Chairperson



HOD



Guidelines:

- a) The number of assessments for a course shall range from 4 to 6.
- b) Every course shall have a final assessment on the entire syllabus with at least 30% weightage.
- c) One compensation assessment for absentees in assessments (other than final assessment) is mandatory. Only genuine cases of absence shall be considered. Details of compensation assessment to be specified by faculty.
- d) The passing minimum shall be as per the regulations.
- e) Attendance policy and the policy on academic dishonesty & plagiarism by students are uniform for all the courses.
- f) Absolute grading policy shall be incorporated if the number of students per course is less than 10.
- g) Necessary care shall be taken to ensure that the course plan is reasonable and is objective.