

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

COURSE PLAN – PART I			
Name of the programme and specialization	B.TECH.(VII - Semester)		
Course Title	MICROWAVE ELECTRONICS		
Course Code	ECPC29	No. of Credits	3
Course Code of Pre-requisite subject(s)	ECPC25		
Session	July 2018	Section (if, applicable)	A
Name of Faculty	Dr.N.GUNAVATHI	Department	ECE
Email	gunavathi@nitt.edu	Telephone No.	9489536873
Name of Course Coordinator(s) (if, applicable)	-		
E-mail	-	Telephone No.	
Course Type	<input checked="" type="checkbox"/> Core course	<input type="checkbox"/> Elective course	

Syllabus (approved in BoS)

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.

Travelling-wave tubes: Slow-wave structures, Helix TWT- Amplification process, Convection current, Wave modes and gain; Coupled cavity TWT, Backward wave oscillator.

Crossed -field devices: Magnetrons- Principle of operation, characteristics, Hull cut-off condition; Carcinotron, Gyrotron.

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.

Transferred electron and Avalanche transit-time devices: Gunn diode, Gunn diode as an oscillator. IMPATT, TRAPATT and BARITT.

COURSE OBJECTIVES	
To develop a fundamental understanding of evolution of microwave active devices and their working principle and applications	
COURSE OUTCOMES (CO)	
Course Outcomes	Aligned Programme Outcomes (PO)
1. Apply the basic knowledge of waveguide and microwave resonator circuits.	PO1,PO2, PO4,PO12
2. Asses the methods used for generation and amplification of the microwave power.	PO1,PO2, PO4,PO12
3. Distinguish between the linear and cross field electron beam microwave tubes	PO1,PO2, PO4,PO12
4. Critically analyze the operating principles and performances of the microwave semiconductor devices.	PO1,PO2, PO4,PO12
5. Identify the suitable microwave power sources of given specification for the selected application.	PO1,PO2, PO4,PO12

COURSE PLAN – PART II			
COURSE OVERVIEW			
<p>This course brings the basic concepts of Limitations of conventional vacuum tubes, Working principle of - Klystrons, Multi-cavity klystron, Reflex klystron ,Travelling-wave tubes, Magnetrons, Carcinotron, Gyrotron. Microwave transistors, FETs, Microwave tunnel diode, Transferred electron and Avalanche transit-time devices.</p>			
COURSE TEACHING AND LEARNING ACTIVITIES			
S.No.	Week/Contact Hours	Topic	Mode of Delivery
1.	1 st	Introduction to Microwave Electronics,Limitations of conventional vacuum tubes, Working of Two cavity klystron amplifier.	Chalk and Talk
2.	2 nd	Two cavity klystron: Quantitative analysis of Velocity modulation process, Bunching process ,Power output and efficiency;	Chalk and Talk

3.	3 rd	Multi-cavity klystron, Reflex klystron-Velocity modulation process, Mode Characteristics, Electronic admittance spiral.	Chalk and Talk
4.	4 th	Travelling-wave tubes: Slow-wave structures, Helix TWT- Amplification process,	Chalk and Talk
5	5 th	Convection current, Wave modes and gain; Coupled cavity TWT, Backward wave oscillator.	Chalk and Talk
6	6 th	Crossed -field devices: Magnetrons-Principle of operation, characteristics,	Chalk and Talk
7	7 th	Hull cut-off condition; Carcinotron, Gyrotron.	Chalk and Talk/ PPT
8	8 th	Microwave bipolar transistors-Physical structures, characteristics,	Chalk and Talk/PPT
9	9 th	Power-frequency limitations; Microwave tunnel diode	Chalk and Talk/PPT
10	10 th	Microwave unipolar transistor – Physical structure, principle of operation, characteristics, High electron-mobility transistors.	Chalk and Talk/PPT
11	11 th	Transferred electron and Avalanche transit-time devices: Gunn diode, Gunn diode as an oscillator.	Chalk and Talk/ PPT
12	12 th	IMPATT, TRAPATT and BARITT.	Chalk and Talk/ PPT

COURSE ASSESSMENT METHODS (shall range from 4 to 6)

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	ASSESSMENT I Descriptive Type Examination (2 Units)		60 Minutes	20
2	ASSESSMENT II Descriptive Type Examination (2 Units)		60 Minutes	20
CPA	Compensation Assessment*		60 Minutes	20

3	SEMINARS / ASSIGNMENTS/ CLASS TEST			10
4	Final Assessment * Descriptive Type Examination (Unit 1,2,3,4 & 5)		180 Minutes	50

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

1. Direct feedback from the students by having face-to-face meeting individually and as the class as a whole.
2. Feedback from the students during the class committee meetings

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

All students are expected to do their work. The taking of information by means of copying homework assignments, or looking or attempting to look at another student's paper during an examination is considered dishonest.

Also preventing or hampering other students from pursuing their academic activities is also considered as academic dishonest.

Any evidence of such academic dishonesty will result in the loss of all marks on that assignment or exam.

- Students opting for plagiarism during exams will be summarily sent out and awarded zero marks for that exam.
- Students honestly producing original work will be rewarded with better marks.

Students not having 75% minimum attendance at the end of the semester will have to repeat the course. Students who do not maintain 75% attendance between the assessments without any valid reason will be warned the first time and will be stopped from future assessments if they persists in abstaining from classes.

MODE OF CORRESPONDENCE (email/ phone etc): email /phone

COMPENSATION ASSESSMENT POLICY

Students absent for assessment -I/assessment test – II or both with valid reason shall attend compensation assessment.

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

- Students may fix appointments for detailed discussion by sending email to gunavathi@nitt.edu two days prior to the desired appointments date with the topic to discuss. The students must come prepared for the discussion with through background preparation
- Minor doubts will be clarified after the contact hours without any prior appointment.

FOR APPROVAL

Course Faculty  CC-Chairperson  HOD 