DEPARTMENT OF PHYSICS

NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

COURSE PLAN – PART I			
Name of the programme and specialization	**M. Sc - I Semester & Physics**		
Course Title	**ELECTRONICS**		
Course Code	**PH657**	**No. of Credits**	**3**
Course Code of Pre-requisite subject(s)	**NIL**		
0Session	**July 2018**	**Section (if, applicable)**	
Name of Faculty	**Dr. M.C. Santhosh Kumar**	**Department**	**Physics**
Email	**santhoshmc@nitt.edu**	**Telephone No.**	**0431-250-3611**
Name of Course Coordinator(s) (if, applicable)	**Dr. M.C. Santhosh Kumar**		
E-mail	**santhoshmc@nitt.edu**	**Telephone No.**	**0431-250-3611**
Course Type	√ **Core course**	☐ **Elective course**	

Syllabus (approved in BoS)

Objective: To impart a diversified knowledge on circuit analysis, the semiconductor devices, FETs, operational amplifiers and digital circuits and their applications.

Circuit Theorems

Kirchoff's voltage law-voltage division- power in series circuit- Kirchoff's current law –parallel resistance – current division- Star-Delta Transform-Thevenin's and Norton's theorems, superposition and reciprocity theorems with examples-maximum power transfer theorem.

Semiconductor Devices: Diodes and Transistors

p-n junction diodes – Zener diode – tunnel diode – Schottky barrier diode – varactor diode-UJT. Transistors - Biasing characteristics of junction transistors – analysis using re model-fixed bias-voltage divider bias-emitter bias – feedback in amplifiers – effect of negative feedback in amplifiers – FETs – different types –applications.

Oscillators

Oscillator principle – oscillator types – frequency stability, RC oscillators – phase shift oscillator – Wein bridge oscillator – LC tunable oscillators – limitations – multivibrators – monostable and astable – 555 IC timer – sine wave and triangular wave generation – crystal oscillators and their applications.

Operational Amplifiers

Basis of operational amplifier – characteristics – CMRR – inverting and non-inverting modes-sum and difference amplifiers – integrating and differentiating circuits – feedback types – current to voltage (ICVS) and voltage to current (VCIS) conversion –– op-amp application – instrumentation amplifiers – low pass and high pass active filters.

Digital Circuits
Logic gates: De Morgan's law, binary adder, comparators, decoders, multiplexers.
Flip-flops: RS flip-flop, JK flip-flop, JK master-slave flip-flop, T flip-flop, D flip-flop. Shift registers – synchronous and asynchronous counters – registers – A/D and D/A conversion.

COURSE OBJECTIVES

- ✓ To impart a diversified knowledge on circuit analysis
- ✓ Semiconductor devices, FET
- ✓ Operational amplifiers
- ✓ Digital circuits and their applications

COURSE OUTCOMES (CO)

Course Outcomes	**Aligned Programme Outcomes (PO)**
On successful completion of the course the students will be able to ✓ understand the Network theorems and applications. ✓ appreciate the working of Bipolar Transistor Amplifiers, FETs, Oscillators and operational amplifiers ✓ understand the Digital Circuits, Logic gates and applications	✓ Obtain in-depth knowledge on working of electronic devices ✓ Understand basics of digital logic gates and its applications

COURSE PLAN – PART II

COURSE OVERVIEW

This course deals with the fundamentals electronics. It covers topics like network theorems and applications, Bipolar Transistor Amplifiers and FETs, Oscillators, operational amplifiers and Digital Circuits Logic gates. This course will help the student to understand the working principle of many practical electronic equipment used in day today life

COURSE TEACHING AND LEARNING ACTIVITIES

S.No.	**Week/Contact Hours**	**Topic**	**Mode of Delivery**
1	Aug 3rd week	Introduction- course plan – Introduction to circuit theorems.	PPT/Chalk & Talk
2	Aug 4th week	Kirchoff's voltage law-voltage division- power in series circuit- Kirchoff's current law –parallel resistance	Chalk & Talk
3	Aug 5th week	current division- Star-Delta Transform-Thevenin's theorem	Chalk & Talk

4	Sep 1st week	Norton's theorem and examples superposition and reciprocity theorems with examples-maximum power transfer theorem	Chalk & Talk
5	Sep 2nd week	p-n junction diodes – Zener diode – tunnel diode – Schottky barrier diode – varactor diode- UJT	PPT/Chalk & Talk
6	Sep 3rd week	Transistors - Biasing characteristics of junction transistors- fixed bias-voltage divider bias-emitter bias	Chalk & Talk
7	Sep 4th week	Transistor analysis using re model	Chalk & Talk
8	Oct 1st week	feedback in amplifiers – effect of negative feedback in amplifiers – FETs – different types –applications.	PPT/ Chalk & Talk
9	Oct 2nd week	RC oscillators – phase shift oscillator – Wein bridge oscillator – LC tunable oscillators – limitations	PPT/ Chalk & Talk
10	Oct 3rd week	multivibrators – monostable and astable – 555 IC timer – sine wave and triangular wave generation – crystal oscillators and their applications.	PPT/ Chalk & Talk
11	Oct 4th week	Operational Amplifiers Basis of operational amplifier – characteristics– feedback types.	Chalk & Talk
12	Nov 1st week	CMRR – inverting and non-inverting modes- sum and difference amplifiers – integrating and differentiating circuits	Chalk & Talk
13	Nov 2nd week	Current to voltage (ICVS) and voltage to current (VCIS) conversion — op-amp application – instrumentation amplifiers – low pass and high pass active filters	Chalk & Talk
14	Nov 3rd Week	Digital Circuits Logic gates: De Morgan's law, binary adder, comparators, decoders, multiplexers.	PPT/ Chalk & Talk
15	Nov 4th Week	Flipflops: RS flip-flop, JK flip- flop, JK master-slave flip-flops, T flip-flop, D flip-flop. Shift registers	PPT/ Chalk & Talk
16	Nov 5th week	synchronous and asynchronous counters – registers – A/D and D/A conversion.	PPT/ Chalk & Talk
17	Dec 1st week	Final Examination	

COURSE ASSESSMENT METHODS (shall range from 4 to 6)				
S.No.	**Mode of Assessment**	**Week/Date**	**Duration**	**%Weightage**
1	**Assignment - I**	October 1st week	60	20 %
2	**Assignment -II**	November 2nd week	60	20 %
3	**Seminar**	November 3rd week	15 minutes each student	10 %
CPA	**Compensation Assessment***	November 4th week	60 min	
5	**Final Assessment***	Dec. 2nd week	180 min	50 %
Total Theory				**100%**

***mandatory; refer to guidelines**

ESSENTIAL READINGS : Textbooks, reference books, website addresses, journals, etc.

- ✓ J. Milman and C.C. Halkias, Electronic Devices and Circuits, McGraw-Hill (1981).
- ✓ Albert Malvino, David J Bates, Electronics Principles, Tata McGraw-Hill (2007).
- ✓ R.J. Higgins, Electronics with Digital and Analogue Integrated Circuits, Prentice Hall (1983).
- ✓ R. L. Boylsted and L. Nashelsky, Electronic Device and Circuits, Pearson Education (2003).
- ✓ C.L Wadhwa, Network Analysis and Synthesis, New Age International Publishers, (2007).
- ✓ G.B. Calyton, Operation Amplifiers, ELBS (1980).

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

- ✓ Feedback from the students will be collected after 16th week: on knowledge gained, subjects relevant to the course, methodology adopted, aspect of improvement, whether the topics fulfill the course outcome and program outcome.

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

MODE OF CORRESPONDENCE (email/ phone etc)

- ✓ Both e-mail and phone

COMPENSATION ASSESSMENT POLICY

- ✓ It is a test with duration of 60 minutes with 20% weightage

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 COURSE INFORMATION
The faculty member is available for consultation in the evenings. Queries may also be emailed to directly at santhoshmc@nitt.edu
FOR SENATE'S CONSIDERATION

Course Faculty 2/8/18 CC-Chairperson 2/8/18 HOD 6/8/2018

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.**

d) The passing minimum shall be as per the regulations.

B.Tech. Admitted in				P.G.
2018	2017	2016	2015	
35% or class average/2 whichever is greater.		Peak/3 or class average/2 whichever is lower		40%

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.