NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE PLAN – PART I			
Name of the programme and specialization	**M.Tech- Power Electronics**		
Course Title	**Advanced Digital Signal Processing**		
Course Code	**EE 664**	**No. of Credits**	**3**
Course Code of Pre-requisite subject(s)	**Signals and Systems, Circuit Theory**		
Session	**July 2019**	**Section (if, applicable)**	**I Year Power Electronics**
Name of Faculty	**Mr.M.Arumugaraj**	**Department**	**EEE**
Official Email	**arumugaraj@nitt.edu**	**Telephone No.**	**8838368879**
Name of Course Coordinator(s) (if, applicable)			
Official E-mail		**Telephone No.**	
Course Type (please tick appropriately)	☐ **Core course**	☑ **Elective course**	

Syllabus (approved in BoS)

Review of Discrete – Time Signal & System representation in Z – Transform domain – Inverse Z –Transform – Properties – System characterization in Z – domain -- Equivalence between Fourier Transform and the Z - Transform of a Discrete signal.

Sampling in Fourier domain - Discrete Fourier Transform and its properties – Linear filtering using DFT – Resolution of DFT - FFT Algorithm – Radix-2 FFT Algorithm - DIT & DIF Structures - Higher Radix schemes

Classification of filter design - Design of IIR filters – Bilinear transformation technique – Impulse invariance method – Step invariance method.

FIR filter design – Fourier series method - Window function technique - Finite Word Length Effects

Introduction to Multirate Signal Processing - Decimation - Interpolation – Introduction to STFT WT

COURSE OBJECTIVES

Review and understanding of discrete-time systems and signals, Discrete-Time Fourier Transform and its properties, the Fast Fourier Transform, design of Finite Impulse Response (FIR) and Infinite Impulse Response (IIR) filters, implementation of digital filters

MAPPING OF COs with Pos	
Course Outcomes	**Programme Outcomes (PO)**
1. Understand the basic of discrete-time signals, systems and Z-Transform.	**1,2,3,6,7,8,11,12**
2. Perform discrete-time Fourier Transform and digital Fourier Transform.	**1,2,3,6,7,8,9,11,12**
3. Design different kinds of digital filters.	**1,2,3,6,7,8,9,11,12**

COURSE PLAN – PART II

COURSE OVERVIEW

Over the past several decades, the field of Advanced Digital Signal Processing made a significiant impact on many areas of technology.

To allign with the above said requirement, this course is designed for electrical engineering students such a way that it covers the basic concepts like basic of discrete-time signals, systems and Z-Transform, and Deals with the use of z-Transform in the analysis of linear-time invariant systems and realization structures of IIR systmes. Other part of the syllabus engages DTFT and DFT using radix-2 FFT algorithms. This course introduces FIR and IIR filter design by using diffrent techniques. Finally this course give introduction to multirate signal processing and STFT WT.

8COURSE TEACHING AND LEARNING ACTIVITIES

S.No.	Week/Contact Hours	Topic	Mode of Delivery
1	Week 1 29.07.2019 to 02.08.2019 3Contact hours	Review of Discrete – Time Signal & System representation in Z-Transform domain	Lecture Chalk & Talk/PPT
2.	Week 2 05.08.2019 to 09.08.2019 3Contact hours	Inverse Z-Transform – Properties – System characterization in Z-domain	Lecture Chalk & Talk/PPT
3.	Week 3 12.08.2019 to 16.08.2019 3Contact hours	Equivalence between Fourier Transform and the Z – Transform & Sampling in Fourier domain	Lecture Chalk & Talk/PPT
4.	Week 4 19.08.2019 to 23.08.2019 3Contact hours	Discrete Fourier Transform and its properties – Linear filtering using DFT – Resolution of DFT	Lecture Chalk & Talk/PPT
5.	Week 5 26.08.2019 to 30.08.2019 3Contact hours	FFT Algorithm – Radix-2 FFT Algorithm	Lecture Chalk & Talk/PPT

6.	Week 6 02.09.2019 to 06.09.2019 3Contact hours	DIT & DIF Structures - Higher Radix schemes & **Assessment 1**	Lecture Chalk & Talk/PPT
7.	Week 7 09.09.2019 to 13.09.2019 2 Contact hours	Classification of filter design - Design of IIR filters	Lecture Chalk & Talk/PPT
8.	Week 8 16.09.2019 to 20.09.2019 3Contact hours	Bilinear transformation technique	Lecture Chalk & Talk/PPT
9.	Week 9 23.09.2019 to 27.09.2019 3Contact hours	Impulse invariance method – Step invariance method.	Lecture Chalk & Talk/PPT
10.	Week 10 30.09.2019 to 04.10.2019 1Contact hour	FIR filter design	Lecture Chalk & Talk/PPT
11.	Week 11 07.10.2019 to 11.10.2019 2Contact hours	Fourier series method	Lecture Chalk & Talk/PPT
12.	Week 12 14.10.2019 to 18.10.2019 3Contact hours	Window function technique	Lecture Chalk & Talk/PPT
13.	Week 13 21.10.2019 to 25.10.2019 3Contact hours	Finite Word Length Effects & **Assessment 2**	Lecture Chalk & Talk/PPT
14.	Week 14 28.10.2019 to 01.11.2019 3Contact hours	Introduction to Multirate Signal Processing	Lecture Chalk & Talk/PPT
15.	Week 15 04.11.2019 to 08.11.2019 3Contact hours	Decimation - Interpolation	Lecture Chalk & Talk/PPT
16.	Week 16 11.11.2019 to 15.11.2019 2Contact hours & 1hr	Introduction to STFT WT **Compensation Assessment**	Lecture Chalk & Talk/PPT
17.	Week 17 18.11.2019 to 22.11.2019 2 hours	***Final Assessment***	

COURSE ASSESSMENT METHODS

S.No.	Mode of Assessment	Week	Duration	% Weightage

1	Assesment 1	Week 6	1hr	20
2	Assesment 2	Week 13	1hr	20
3	Assignments/Surprise tests/Class notes/Projects/Seminar	Throughout semester		20
CPA	Compensation Assessment*	Week 16	1hr	20
4	Final Assessment *	Week 17	2 hrs	40

ESSENTIAL READINGS: Textbooks, Refernce books, website address, journals,etc

1. John G. Prokis and Dimitris G. Hanolakis, 'Digital Signal Processing, Principles, Algorithms & Applications'
4th Edition, Pearson Education, 2006.
2. Ludemann L. C., 'Fundamentals of Digital Signal Processing', Harper and Row publications,2009.
3. Antoniou A., 'Digital Filters – Analysis and Design', Tata Mc-Graw Hill, 2001.
4. Oppenheim and Schaffer, 'Discrete time Signal processing', Pearson Education, 2007.

COURSE EXIT SURVEY

- Feedback from the students during class committee meetings
- Anonymous feedback through questionnaire (Mid of the semester & End of the semester)
- End semester feedback on course outcomes

COURSE POLICY (including compensation assessment to be specified)

1. Attending all the assessments mandatory for every student
2. One compensation assessment will be conducted for those students who are being physically absent for the assessments 1 and 2 only for the valid reason.
3. At any case CPA will not be considered as an improvement test.
4. Relative grading/Absolute grading will be adopted for the course.

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, IF ANY

FOR APPROVAL

Course Faculty _____ **CC- Chairperson** _____ **HOD** _____

Guidelines

a) The number of assessments for any theory course shall range from 4 to 6.

b) Every theory 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.