ANDHRA LOYOLA INSTITUTE OF ENGINEERING AND TECHNOLOGY

DEPARTEMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

ELECTRONIC DEVICES AND CIRCUITS

Teacher/Instructor: Mr K.SRINIVASA RAO
Assistant Professor

Semester/Year: I/II

Course Outcomes:

1	Factual	**CO1**:This course aims to understand the basic concepts of semiconductor physics and study the physical phenomena such as conduction, transport mechanism and electrical characteristics of different diodes
2	Conceptual	**CO 2**: To understand the application of diodes as rectifiers with their operation and characteristics with and without filters. **CO 3**: To acquire knowledge about the principle of working and operation of Bipolar Junction Transistor and Field Effect Transistor and their characteristics.
3	Procedural	**CO4**: To understand the purpose of transistor biasing and its significance.
4	Applied	**CO 5**: To understand Small signal equivalent circuit analysis of BJT and FET transistor amplifiers and compare different configurations

Textbook:

1. Electronic Devices and Circuits- J. Millman, C. Halkias, Tata Mc-Graw Hill, SecondEdition,2007
2.Electronic Devices and Circuits-K. Lal Kishore, BS Publications, FourthEdition,2016.
3.Electronics devices & circuit theory- Robert L.Boylestad andLouiNashelsky, Pearson/Prentice hall, tenth edition,2009

References:

1.Integrated Electronics-J. Millman, C. Halkias,Tata Mc-Graw Hill, SecondEdition,2009
2.Electronic Devices and Integrated Circuits – B.P. Singh,Rekha , Pearson publications,
3.Electronic Devices and Circuits-Salivahanan, Kumar, Vallavaraj, Tata Mc-Graw Hill, 4thEdition,2008.

Contents/Activities:

1	Factual	1.NPTEL Videos 2.Disscusion Forum On Comparing types of Diodes
2	Conceptual	1..NPTEL Videos 2. Discussion Forum On Applications of Diodes 3.Discussion Forum on difference between BJT & FET
3	Procedural	1. NPTEL Videos 2. Discussion Forum on Transistor Biasing
4	Applied	1. NPTEL Videos 2. Discussion Forum on Transistor Amplifiers

Schedule and Sequence:

Session/week/ Module	Topic	Objectives	Before Class - Videos, e-Books, Case studies	In-Class – Activities, Quiz (M-Minutes)	Post Class - Assignment, Discussion Forum
UNIT-1					
1	Introduction: Review of Semiconductor Physics	Aims to understand the classification between Insulators, Semiconductors, and Metals using energy band diagrams	Video link: https://www.youtube.com/watch?v=Kp-jS6NHsB8&list=PLF178600D851B098F	Explanation about different Materials-40 M Interaction-10M	Assignment: To compare Different Materials using Graphs
2	Introduction: Review of Semiconductor Physics	To understand the mobility and conductivity, electrons and holes in intrinsic semi conductors, extrinsic semi conductors,	Video link: https://www.youtube.com/watch?v=CjAVfW_6juw	Explanation about Mobility & Conductivity-20 M Explanation about Intrinsic & Extrinsic Materials-20 M Interaction-10 M	Assignment: Perform comparative analysis on types of Semiconductors
3	Introduction: Review of Semiconductor Physics	To understand the drift and diffusion, charge densities in semiconductors	Video link: https://www.youtube.com/watch?v=rzxCRJcFaIw	Explanation about Drift and Diffusion-20M Explanation about charge densities in semiconductor-20M Interaction-10M	Assignment: Explain about current Conduction in semiconductors
4	Hall effect, continuity equation	To understand the existence of Hole and existence of different types of Currents in Semiconductors	Video link: https://www.youtube.com/watch?v=FLWcJQhqsvc	Explaination about Hall Effect-20M Explain about Continuity Equation-20M Interaction-10M	Assignment: Do you think there is a relation between currents in semiconductors, comment ?
5	law of junction, Fermi Dirac function	To understand the Law of Junctions	Video link: https://www.youtube.com/watch?v=EhNtsMcSCzI	Explanation about of Law of Junction-15M	Assignment: Depict the Fixed and Variable Capacitance in Semiconductor

				Explanation about Fermi Dirac function-25M Interaction-10M	
6	Fermi level in intrinsic and extrinsic Semiconductors	To understand the Fermi Levels in Semiconductors	Video link: https://www.youtube.com/watch?v=kCN-7wA8HUE	Explanation about Fermi Level in Intrinsic Semiconductor-20M Explanation about Fermi Level in Extrinsic Semiconductor-20M Interaction-10M	Assignment: Can you depict the types of Semiconductor
7	Energy band diagram of PN junction Diode, Open circuited p- n junction	To understand the working of P-N Junction with Energy Band Diagram	Video link: https://www.youtube.com/watch?v=KqE5JIPIhlU	Explanation about P-N diode with Energy band diagram-20M Explain about Open Circuited P-N junction-20 M Interaction-10M	Assignment: Could you explain the Charge Transfer in P-N Diode
8	Biased p-n junction ,p-n junction diode	To understand the working of p-n junction diode	Video link: https://www.youtube.com/watch?v=E-e7b64u0ok	Explain about Biased p-n junction-20M Explain about p-n junction diode-20M Interaction-10M	Assignment: How does a p-n junction diode work, comment
9	current components in PN junction Diode, diode equation	To understand the current components of p-n junction diode	Video link: https://www.youtube.com/watch?v=iBsuJ2eGCIU	Explanation about current components in PN junction Diode-20M Explanation about Diode Equation-20M Interaction-10M	Assignment: Find out the relation of charge components in p-n diode

10	V-I Characteristics, temperature dependence on V-I characteristics	To understand the V-I characteristics of p-n diode	Video link: https://www.youtube.com/watch?v=U2ukATzQCFo	Explain about V-I Characteristics-20M temperature dependence on V-I characteristics-20M Interaction-10M	Assignment: How does Temperature effect on V-I characteristics , comment?
11	Diode resistance, Diode capacitance.	To understand Diode Resistance and Capacitance	Video link: https://www.youtube.com/watch?v=hag5ss1ZxH0	Explanation about Diode Resistance and Capacitance-20M **Quiz-30M**	Assignment: Do Variable Capacitance exists in Diode comment?
12	Problems				
UNIT-2					
1	Zener Diode, Breakdown mechanisms, Zener diode applications	To understand the working of Zener Diode	Video link: https://www.youtube.com/watch?v=MZPeRlst8rQ	Explain about working of Zener Diode-20M Explain about Zener Breakdown-10M Applications of Zener Diode-10M Interaction-10M	Assignment: Give out the importance of Zener Breakdown ?
2	LED, Varactor Diode, Photodiode	To understand the working of special diodes	Video link: https://www.youtube.com/watch?v=cRhAUx6w4Cg	Explanation about LED-20M Explanation about Varactor diode-10M Explanation about Photo Diode-10M Interaction-10M	Assignment: List out frequency ranges of diodes?
3	Tunnel Diode	To understand the Tunnelling Effect	Video link: https://www.youtube.com/watch?v=hNzLQdFW-FI	Explanation about Construction of Tunnel Diode-20M Explanation about Tunneling Effect-20M Interaction-10M	Assignment: Depict the Tunnelling Effect with neat diagrams

4	UJT, PN-PN Diode	To understand working of UJT Diode for generating Non Sinusoidal Waveforms	Video link: https://www.youtube.com/watch?v=D6-ikJFUoFc	Explanation about UJT-20M Explanation about PN-PN Diode-20M Interaction-10M	Assignment: Write a short note on Non-Sinusoidal waveform generation
5	SCR. Construction, operation and V-I characteristics.	To understand the working of SCR	Video link: https://www.youtube.com/watch?v=JZ2PcZSsLG8	Explanation about Construction of SCR-20M Explanation about operation of SCR-20M Interaction-10M	Assignment: How does High power Controlled by SCR, comment?
6	Basic Rectifier setup, half wave rectifier	To understand the working of Half wave rectifier	Video link: https://www.youtube.com/watch?v=Ll0IOk_Ltfc	Explanation about Rectifier Setup-20M Explanation about Half Wave Rectifier-20M Interaction-10M	Assignment: List out the applications of Rectifier?
7	full wave rectifier	To understand the working of Full wave rectifier	Video link: https://www.youtube.com/watch?v=74QrYyYsftY	Explanation about Full Wave Rectifier -20M Derivation about Full Wave Rectifier -20M Interaction-10M	Assignment: Design a Circuit to convert AC to DC ?
8	bridge rectifier, derivations of characteristics of rectifiers,	To understand the working of Bridge rectifier	Video link: https://www.youtube.com/watch?v=34hWklTgzbI	Explanation about Bridge Rectifier -20M Explanation about characteristics of rectifiers-20M Interaction-10M	Assignment: Derive the Ripple factor of Half wave, Full wave, Bridge Rectifier?
9	rectifier circuits-operation, input and output waveforms,	To understand the working of Rectifiers with the waveforms	Video link:	Explanation about Rectifier Circuits with waveforms-40M	Assignment: Depict the rectifier waveforms?

			https://www.youtube.com/watch?v=wMdRfXxa7EY	Interaction-10M	
10	Filters, Inductor filter(Series inductor), Capacitor filter(Stunt inductor), π- Filter	To understand the working of Series and Shunt Filters	Video link: https://www.youtube.com/watch?v=XDY2KTHJ7eg	Explanation about Inductor Filter-20M Explanation about Shunt Filter-20M Interaction-10M	Assignment: List out the applications of Inductor Filter and Capacitor Filter?
11	comparison of various filter circuits in terms of ripple factors	To understand the Ripple factor in various circuits	Video link: https://www.youtube.com/watch?v=ruEYtTYePRk	Explanation about various filter circuits With Ripple factor-40M Interaction-10M	Assignment: Comment on the best rectifier circuit in terms of Ripple factor?
12	Problems			Problems-30M Quiz-20M	
UNIT-3					
1	Junction transistor, transistor current components	To understand the working of Junction Transistor	Video link: https://www.youtube.com/watch?v=mlUy0Eyyndc	Explanation about working of Junction Transistor-20M Explanation about transistor current components-20M Interaction-10M	Assignment: Compare PN diode and BJT
2	transistor equation, transistor configurations	To understand different Transistor Configurations	Video link: https://www.youtube.com/watch?v=2_Whn_Be1GQ	Explanation about transistor equation -20M Explanation about transistor configurations -20M Interaction-10M	Assignment: Write a short notes on Transistor configurations

3	transistor as an amplifier	To understand the working of Transistor as an amplifier	Video link: https://www.youtube.com/watch?v=KJQfj8cZF_Q	Explanation about Transistor as an amplifier-40M Interaction-10M	Discussion Forum: Unique features of Transistor
4	characteristics of transistor in Common Base, Common Emitter and Common Collector configurations	To understand the characteristics of Transistor in different configurations	Video link:\ https://www.youtube.com/watch?v=RjbiPC3NMVg	Explanation about Transistor Configurations in CB,CE,CC -40M Interaction-10M	Assignment: Compare different Transistor Configurations
5	Eber's-Moll model of a transistor	To understand the working of Transistor in different regions	Video link: https://www.youtube.com/watch?v=KeorTJGunlU	Eber's-Moll model Explanation-40M Interaction-10M	Assignment: Give the Importance of Eber's-Moll model
6	punch through/ reach through,	To understand the principle of punch through	Video link: https://www.youtube.com/watch?v=Ucskse6xgqY	Explanation about punch through-40M Interaction-10M	Assignment: Explain how Transistor can be protected from burning
7	Photo transistor, typical transistor junction voltage values	To understand the working of Photo Transistor	Video link: https://www.youtube.com/watch?v=PoclquSo3-Q	Explanation about Photo Transistor-20M Explanation about Transistor Junction voltage-20M Interaction-10M	Assignment: Write a short notes on working of Photo Transistor
8	FET types, construction, operation	To understand the working of FET construction	Video link:	Explain about working of FET-40M Interaction-10M	Assignment:

			https://www.youtube.com/watch?v=2I_8YNVgbEw		What is the differences between BJT & FET
9	Characteristics μ, gm, rd parameters	To understand the characteristics of FET	Video link: https://www.youtube.com/watch?v=yy0co4BdrIg	Explain about characteristics of FET-40M Interaction-10M	Assignment: Write short notes about characteristics of FET?
10	MOSFET-types, construction,	To understand the working of MOSFET	Video link: https://www.youtube.com/watch?v=GrvvkYTW_0k	Explain about MOSFET types-20M Explain about construction of FET-20M	Assignment: Depict the construction of MOSFET
11	MOSFET operation, characteristics	To understand the operation of MOSFET with characteristics	Video link: https://www.youtube.com/watch?v=1KXhx8lXIJM	Explain about operation of MOSFET-20M Explain about characteristics of MOSFET-20M Interaction-10M	Assignment: Write short notes on working of MOSFET
12	Comparison between JFET and MOSFET.	To understand the differences Between JFET & MOSFET	Video link: https://www.youtube.com/watch?v=C9Kdkkh1n_g	Compare JFET & MOSFET-20M Quiz-30M	Assignment: What is ability of MOSFET when compared to other Transistors?
UNIT-4					
1	Need for biasing, operating point	To understand the principle biasing the BJT	Video link: https://www.youtube.com/watch?v=5T84Jzcgj7M	Explain about need for biasing-20M Explain operating point-20M Interaction-10M	Assignment: Can gain can be increased by Biasing comment

2	load line analysis ,BJT biasing- methods	To understand the BJT biasing methods	Video link: https://www.youtube.com/watch?v=5T84Jzcgj7M	Explanation about load line analysis-20M BJT biasing methods-20M Interaction-10M	Assignment: Write down the importance of Load line analysis
3	basic stability, fixed bias,	To understand the fixed biasing technique	Video link: https://www.youtube.com/watch?v=L6DK3PqeNLw	Explanation about Stability-15M Explanation about Fixed Bias-25M Interaction-10M	Assignment: Write about advantages of Fixed bias
4	collector to base bias	To understand the collector to base bias technique	Video link: https://www.youtube.com/watch?v=wg0OqrUXDjI	Explanation about collector to base bias -40M Interaction-10M	Assignment: Write about advantages of collector to base bias
5	self bias, Stabilization against variations in VBE, Ic, and β	To know the importance of Stabilization in BJT	Video link: https://www.youtube.com/watch?v=jw_GUiswndw	Explanation about self bias -20M Explanation about , Stabilization against variations in VBE, Ic, and β-20M Interaction-10M	Assignment: Compare the biasing techniques of BJT
6	Stability factors, (S,S',S''), Bias compensation,	To understand stability factors in BJT	Video link: https://www.youtube.com/watch?v=O42V9TlCp1k	Explanation about Stability factors, (S,S',S'')-20M Explanation about Bias compensation-20M Interaction-10M	Assignment: Write short notes on Bias compensation

7	Thermal runaway, Thermal stability.	To understand the Thermal runaway, Thermal Stability	Video link: https://www.youtube.com/watch?v=JR4DrpII8vk	Explanation about Thermal runaway-20M Explanation about Thermal stability-20M Interaction-10M	Assignment: Comment on the prominence of Thermal Stability
8	FET Biasing- methods	To understand the FET biasing methods	Video link: https://www.youtube.com/watch?v=0mgWEAEZ_88	Explanation about FET Biasing- methods 40-M Interaction-10M	Assignment: Which biasing method is best for FET , comment
9	FET stabilization	To understand the FET biasing methods	Video link: https://www.youtube.com/watch?v=mgUW942Xc_M	Explanation about FET stabilization 20M Quiz-30M	Assignment: Write short notes on FET Stabilization
UNIT-5					
1	**BJT:** Two port network, Transistor hybrid model	To understand Transistor Hybrid model	Video link: https://www.youtube.com/watch?v=e77vGIF_dOQ	Explanation about Two port network-20M Explain about Transistor Hybrid model-20M Interaction-10M	Assignment: Write short note on Hybrid model of Transistor
2	determination of h-parameters	To understand the need of h-parameters	Video link: https://www.youtube.com/watch?v=EC83XRahOSg	Explain about determination of h-parameters-40M Interaction-10M	Assignment: Find out h11,h12,h21,h22

3	conversion of h-parameters	To understand the conversion of h-parameters	Video link: https://www.youtube.com/watch?v=Nj0-soFpO_s	Explain about conversion of h-parameters -40M Interaction-10M	Assignment: Write about conversion from h-parameters
4	generalized analysis of transistor amplifier model using h-parameters,	To understand the analysis of transistor amplifier model using h-parameters	Video link: https://www.youtube.com/watch?v=GCumCTyR60U	Explain about transistor amplifier model using h-parameters-40M Interaction-10M	Assignment: Explain about amplifier model with necessary equations
5	Analysis of CB, CE and CC amplifiers using exact and approximate analysis	To analyze the CB,CE,CC amplifiers using exact and approximate analysis	Video link: https://www.youtube.com/watch?v=Ug2kUD7InbU	To analyze CB,CE Amplifiers-40M Interaction-10M	Assignment: Analyze CB amplifier Using exact analysis
6	Analysis of CB, CE and CC amplifiers using exact and approximate analysis	To analyze the CB,CE,CC amplifiers using exact and approximate analysis	Video link: https://www.youtube.com/watch?v=Kj35qgtA9jU https://www.youtube.com/watch?v=Z9oCmnvsAbw&pbjreload=101	To analyze CC Amplifiers-40M Interaction-10M	Assignment: Analyze CC amplifier Using exact analysis
7	Comparison of transistor amplifiers.	To understand the comparison of transistor amplifier configuration	Video link: https://www.youtube.com/watch?v=V-SoVnn0-nI	Comparison of transistor amplifiers-40M Interaction-10M	Discussion Forum: Comparison of transistor amplifiers

8	**FET:** Generalized analysis of small signal model	To analyze the FET using Small signal model	Video link: https://www.youtube.com/watch?v=TjA_bBYExxo	Generalized analysis of small signal model FET-40M Interaction-10M	Assignment: With necessary equations explain small signal model
9	Analysis of CG, CS and CD amplifiers	To analyze the FET amplifier types	Video link: https://www.youtube.com/watch?v=PCbbrn-aLu4	To analyze CG,CS Amplifiers-40M Interaction-10M	Assignment: Analyze CG model with necessary equations
10	Analysis of CG, CS and CD amplifiers	To analyze the FET amplifier types	Video link: https://www.youtube.com/watch?v=vVUbJyBtUbw https://www.youtube.com/watch?v=1KXUYYBlQX8	To analyze CD Amplifiers-40M Interaction-10M	Assignment: Analyze CD model with necessary equations
11	Comparison of FET amplifiers.	To understand the comparisons between FET amplifiers	Video link: https://www.youtube.com/watch?v=5kRjxNg4kLk	Comparison of JFET amplifiers-20M Quiz-30M	Discussion Forum: Comparison of jfet amplifiers

SIGNATURE OF THE FACULTY **SIGNATURE OF HEAD OF THE DEPARTMENT**

Evaluation:

Formative Assessment – 50%

Summative Assessment – 50%