JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

II Year-I Semester		L	T	P	C
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ELECTRONIC DEVICES AND CIRCUITS					

CourseObjectives:

Themain objectives ofthis courseare

- To learn and understand the basic concepts of semi conductor physics.
- Study the physical phenomena such as conduction, transport mechanism and electrical characteristics of different diodes.
- To learn and understand the application of diodes as rectifiers with their operation and characteristics with and without filters are discussed.
- Acquire knowledge about the principle of working and operation of Bipolar Junction Transistor and Field Effect Transistor and their characteristics.
- To learn and understand the purpose of transist or biasing and its significance.
- Small signal equivalent circuit analysis of BJT and FET transist or amplifiers and compare different configurations.

UNIT-I: Review of Semiconductor Physics: Hall effect, continuity equation, law of junction,FermiDiracfunction, Fermilevel in intrinsic andextrinsicSemiconductors

Junction Diode Characteristics : energy band diagram of PN junction Diode, Open circuited p-n junction, Biased p-n junction, p-n junction diode, current components in PN junction Diode,diodeequation,V-ICharacteristics,temperaturedependenceonV-Icharacteristics,Diioderesistance,Diodecapacitance.

UNIT-II:
SpecialSemiconductorDevices:ZenerDiode,Breakdownmechanisms,Zenerdiodeapplications, LED,VaractorDiode,Photodiode,TunnelDiode,UJT,PN-PNDiode,SCR.Construction,operation and V-Icharacteristics.
Rectifiers and Filters: Basic Rectifier setup**,** half wave rectifier, full wave rectifier, bridgerectifier, derivations of characteristics of rectifiers, rectifier circuits-operation, input and outputwaveforms, Filters, Inductor filter(Series inductor), Capacitor filter(Stunt inductor), π- Filter,comparisonof various filtercircuits in terms ofripple factors.

UNIT-III: Transistor Characteristics:
BJT: Junctiontransistor,transistorcurrentcomponents,transistorequation,transistorconfigurations, transistor as an amplifier, characteristics of transistor in Common Base, CommonEmitter and Common Collector configurations, Ebers-Moll model of a transistor, punch through/reachthrough, Photo transistor,typical transistor junction voltagevalues.
FET: FET types, construction, operation, characteristicsμ, g_m, $r_d$parameters, MOSFET-types, construction, operation, characteristics, comparisonbetween JFETand MOSFET.

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UNIT- IV: Transistor Biasing and Thermal Stabilization : Need for biasing, operating point,load line analysis, BJT biasing- methods, basic stability, fixed bias, collector to base bias,

selfbias,StabilizationagainstvariationsinV$_{BE}$,Ic,andβ,Stabilityfactors,(S,S$'$,S$''$),Biascompensation,Thermalrunaway, Thermal stability.

FETBiasing-methodsandstabilization.

UNIT-V: Small Signal Low Frequency Transistor Amplifier Models:
BJT: Two port network, Transistor hybrid model, determination of h-parameters, conversion ofh-parameters, generalized analysis of transistor amplifier model using h-parameters, Analysis ofCB, CE and CC amplifiers using exact and approximate analysis, Comparison of transistoramplifiers.
FET: Generalized analysis of small signal model, Analysis of CG, CS and CD amplifiers,comparisonofFETamplifiers.

TextBooks:

1. Electronic Devices and Circuits-J.Millman, C.Halkias, TataMc-GrawHill, Second Edition, 2007
2. Electronic Devices and Circuits-K. Lal Kishore, BS Publications, Fourth Edition, 2016.
3. Electronics devices & circuit theory-Robert L.Boylestad and Loui Nashelsky, Pearson / Prenticehall, tenthedition, 2009

References:

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

CourseOutcomes:
Atthe endofthiscourse thestudent willbe ableto

- Applythebasicconceptsofsemiconductorphysics.
- Understandthe formationofp-njunctionandhowitcanbeusedasap-njunctionas diodeindifferentmodes ofoperation.
- Knowtheconstruction,workingprincipleofrectifierswithandwithoutfilterswithrelevant expressions andnecessarycomparisons.
- Understandtheconstruction,principleofoperationoftransistors,BJTandFETwiththeirV-Icharacteristicsindifferentconfigurations.
- Know the need of transistor biasing, various biasing techniques for BJT and FETandstabilization concepts with necessaryexpressions.
- Performtheanalysisofsmallsignallowfrequencytransistoramplifiercircuitsusing BJT and FET indifferentconfigurations