2018.4.13 **शैक्षिक सत्र 2018-19 के आड सेमेस्टर के समस्त बी0टेक0 पाठ्यक्रमों हेतु बोर्ड आफ स्टडीज द्वारा संस्तुत परीक्षकों की सूची का अवलोकन एवं विभिन्न विभागो द्वारा स्नातक पाठ्यक्रमों के सैलेबस में किये गये संशोधनो का अनुमोदन।**

शैक्षिक सत्र 2018-19 के आड सेमेस्टर के समस्त बी0टेक0 पाठ्यक्रमों हेतु बोर्ड आफ स्टडीज द्वारा संस्तुत लिखित एवं प्रायोगिक परीक्षा का पैनल प्राप्त किया गया, जिसे माननीय कुलपति महोदय के अनुमोदनोपरान्त परीक्षा नियंत्रक को अग्रिम कार्यवाही हेतु प्रेषित किया गया।

निम्न विभागो से प्राप्त प्रस्ताव विद्या परिषद के अनुमोदनार्थ निम्न प्रस्ताव प्रस्तुत हैः-

रसायन अभि0 विभाग

1. बी0टेक0 (रसायन अभि0) के द्वितीय एवं तृतीय वर्ष के सम सेमेस्टर का पाठ्यक्रम
2. बी0टेक0 तृतीय वर्ष के सम सेमेस्टर के विभागीय इलेक्टिव कोर्स का पाठ्यक्रम
3. बी0टेक0 तृतीय वर्ष (रसायन अभि0) सम सेमेस्टर के विभागीय इलेक्टिव कोर्स का निर्धारण
4. बी0टेक0 चतुर्थ वर्ष के विषम तथा सम सेमेस्टर के कोर्स स्ट्क्चर तथा NPTEL कोर्स को बी0टेक0 तृतीय वर्ष (रसायन अभि0) विषम सेमेस्टर हेतु विभागीय इलेक्टिव कोर्स के रूप में निर्धारण।

विभागाध्यक्ष, रसायन अभि0 विभाग द्वारा अग्रसारित बोर्ड आफ स्टडीज से संस्तुत उपरोक्त प्रस्ताव विद्या परिषद के माननीय सदस्यों के अवलोकनार्थ पृष्ठ संख्या 171 से पृष्ठ संख्या 216 पर प्रस्तुत है।

विद्या परिषद के माननीय सदस्यों से अनुरोध है कि कृपया उक्त का अनुमोदन प्रदान करने की कृपा करें।

विद्युतकण एवं संचार अभि0 विभाग

निम्न विषयों के पाठ्यक्रम में संशोधन तथा सत्र 2019-20 से एक नये इलेक्टिव कोर्स के अध्यापन का प्रस्तावः-

विषय कोड	विषय का नाम	प्रभावी होने का सत्र
Course Syllabus Revised		
BEC – 11A	Network Analysis and Synthesis	2019-20
BEC – 15A	Solid State Devices and Circuits	
BEC – 27A	Analog Integrated Circuit	
BEC – 41A	VLSI Design	
BEC – 43A	Wireless Communication	
BEC – 54A	Advanced Semiconductor	
BEC – 58A	Fundamental of Satellite	
BEC – 68A	Neural Network	
BEC – 29A	Electonics Measurement and Instrumentation	
BEC – 42A	Digital Signal Processing	
New Course Proposed		
BOE – 25	Industrial Instrumentation	2019-20

विद्या परिषद के माननीय सदस्यों के अवलोकनार्थ पृष्ठ संख्या 217 से पृष्ठ संख्या 235 पर प्रस्तुत है।

विद्या परिषद के माननीय सदस्यों से अनुरोध है कि कृपया उक्त का अनुमोदन प्रदान करने की कृपा करें।

Department of Electronics & Communication Engineering
M.M.M. University of Technology,
Gorakhpur

No.ECE/ 635 /2018 Date: 29/09/2018

Dean (UG Studies and Entrepreneurship)

The BOS meeting of Electronics & Communication Engineering Department held in the chamber of HOD on dated 29/09/2018 at 11.30 A.M.

The following members were present:-

1.	Prof S.K.Soni	HOD/ Chairman
2.	Prof Y.N. Singh	External Member
3.	Sri Rahul Singh	External Member
4.	Prof. R. K. Chauhan	Member
5.	Sri G.S.Tripathi	Member
6.	Dr. Manish Kumar	Member
7.	Dr Rajan Mishra	Member
8.	Sri Gagandeep Bharti	Member
9.	Dr. Sudhanshu Verma	Member
10.	Dr Pooja Lohia	Member
11.	Dr. Dharmendra Kumar	Member
12.	Sri Anupam Sahu	Member
13.	Dr. B.P.Pandey	Member

Following matters were discussed and finalized.

1. The Panel of Theory Examiners of B.Tech. Odd semester session 2018-2019 is finalized.
2. The Panel of Practical Examiners (Examiner-I and Examiner-II) for Practical Evaluation of B.Tech. students is finalized.
3. Course Syllabus of Following subjects of B.Tech.are revised
   (i) Network Analysis and Synthesis (BEC-11)
   (ii) Solid State Devices and Circuits (BEC-15)
   (iii) Analog Integrated Circuit (BEC-27)
   (iv) VLSI Design (BEC-41)
   (v) Wireless Communication (BEC-43)
   (vi) Advanced Semiconductor Devices (BEC-54)
   (vii) Fundamental of Satellite Communication (BEC-58)
   (viii) Neural Network (BEC-68)
   (ix) Electronic Measurement and Instrumentation (BEC-29)
   (x) Digital Signal Processing (BEC-42)
4. Following new course is proposed
   (i) Industrial Instrumentation (BOE-25) (to be run from session 2019-20)
5. A list of NPTEL online courses was discussed and finalized.
   Meeting ended with thanks to the chair.

(Prof S.K.Soni)
Head
H.E.C.E.D.

BEC-11	NETWORK ANALYSIS & SYNTHESIS	
Course category	:	Department Core (DC)
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture : 3, Tutorial : 1 , Practical: 0
Number of Credits	:	4
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes and Three Minor tests and One Major Theory Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Able to apply the Thévenin, Norton, nodal and mesh analysis to express complex circuits in their simpler equivalent forms.
2. Able to apply linearity and superposition concepts to analyze RL, RC, and RLC circuits in time and frequency domains.
3. Able to analyze resonant circuits both in time and frequency domains.
4. Able to construct and make time and frequency domain measurements on elementary RL, RC, and RLC circuits.
5. Understand the fundamental concepts of network analysis and synthesis of two-port passive networks.

Topics Covered

UNIT-I	
Signal analysis, Complex frequency, Network analysis, Network synthesis General characteristics and descriptions of signals, with associated wave forms, Unit step function, Unit impulse and ramp function. Introduction to network analysis, network elements, Initial and final conditions, Solution of network equations, Maximum Power Transfer Theorem, Milliman's Theorem.	9
UNIT-II	
Review of Laplace transforms poles and zeroes, Initial and final value theorems, Transform circuit, Thevenin's and Norton's theorems, System function, step and impulse responses, Convolution integral. Amplitude and phase responses. Network functions, Relation between port parameters, Transfer functions using two port parameters, Interconnection of two ports.	9
UNIT-III	
Hurwitz polynomials, Positive real functions, Synthesis using Cauer and Foster: Properties of real immittance functions, synthesis of LC driving point immittances, Properties of RC driving point impedances, Synthesis of RC impedances or RL admittances, Properties of RL impedances and RC admittances..	9
UNIT-IV	
Concept of Poles and Zeros on the Stability, Properties of Open Circuit and Short Circuit Parameters, Zeroes of transmission, Synthesis of Y21 and Z21 with 1Ω terminations Introduction to active network synthesis.	9

Books & References

1. Franklin F. Kuo, "Network Analysis and synthesis", 2nd Edition, Wiley India Pvt Ltd.
2. Behrouz Peikari, "Fundamentals of Network Analysis & synthesis", Jaico Publishing House, 2006.
3. M.E. Van Valkenberg, "Network Analysis", 2nd Edition, Prentice Hall of India Ltd

BEC-15	SOLID STATE DEVICES & CIRCUITS	
Course category	:	Department Core (DC)
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture : 3, Tutorial : 1 , Practical: 2
Number of Credits	:	5
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce and Three Minor tests and One Major Theory & Practical Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Ability to understand the basic operation and working of different diodes like PIN, Varactor diode etc.
2. To understand the high frequency application of diodes.
3. To understand and use of the device models to explain and calculate the characteristics of the field effect transistors.
4. To be able to understand and analyze the V-I characteristics of different high power devices.
5. Understand the operation of charge-transfer devices and charge storage device.

Topics Covered

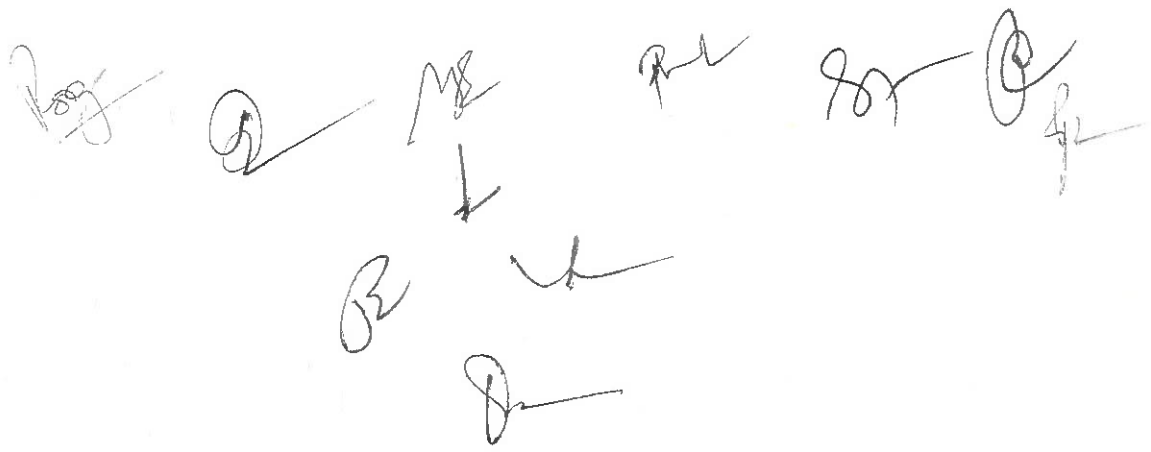
UNIT-I	9
Crystal Properties and charge Carriers in Semiconductors, Elemental and compound semiconductor materials, Energy bands in solids, charge carriers in semiconductors, Donor/Acceptor carrier concentrations, Mobility and Conductivity, drift of carriers in electric and magnetic fields, Potential variation within a graded semiconductor, p-n junction behavior, Charge control description of a diode. Special Diodes: Varactor diode, Zener Diode, Schottky barrier diode, Light Emitting diode, Photo diode, Characteristics and applications.	
UNIT-II	9
BJT: Review of device structure operation and V-I characteristics, BJT circuits at DC, BJT as amplifier and switch, biasing in BJT amplifier circuit, small-signal operation and models, single stage BJT amplifier, BJT internal capacitances and high frequency model, frequency response of CE amplifier. Darlington pair, BJT differential pair, Cascode and Cascade amplifier.	
UNIT-III	9
MOSFET: Review of device structure operation and V-I characteristics. Circuits at DC, MOSFET as Amplifier and switch, Biasing in MOS amplifier circuits, small-signal operation and models, single stage MOS amplifier, MOSFET internal capacitances and high frequency model, frequency response of CS amplifier.	
UNIT-IV	9
Feedback Amplifiers: The general feedback structure, properties of negative feed- back, the four basic feedback topologies, the series-shunt feedback amplifier, the series-series feedback amplifier, the shunt-shunt and shunt-series feedback amplifier. **Oscillators:** Basic principles of sinusoidal oscillators, RC Phase-shift Oscillator circuits, Resonant-circuit oscillators.	

EXPERIMENTS

1. Study of JFET drain and transfer characteristics.
2. JFET biasing arrangement Graphical method.
3. Build and Test JFET CS amplifier. Find performance parameters for JFET amplifier - A_V, Ri, R_O.
4. Simulation of JFET CS amplifier using multisim/spice.Find performance parameters for JFET amplifier - A_V, Ri, R_O and compare with theoretical and practical results.
5. Input and Output Characteristics of BJT CE configuration. Find h parameters from characteristics.
6. Build and Test BJT in CE amplifier and find performance parameters - A_V, Ri, R_O, Ai
7. Simulation of BJT CE amplifier using multisim/spice.
8. Find performance parameters for BJT amplifier - A_V, Ri, R_O,Ai and compare with theoretical and practical results.
9. Comparison of CE, CC, CB configurations in terms of A_V, Ri, R_o ,Ai
10. Study of MOSFET drain and transfer characteristics
11. Frequency response - For BJT/ FET single stage amplifiers - Effect of unbypassed R_E and R_S.
12. Effect of coupling and bypass capacitors on low frequency cut-off.

Books & References

1. Milman, Halkias&Jit- Electronics Devices and Circuits- TMH
2. Donald ANeaman, "Semiconductor Physics and Devices Basic Principles", 3e, TMH India.



BEC-27	ANALOG INTEGRATED CIRCUITS	
Course category	:	Department Core (DC)
Pre-requisite Subject	:	Solid State Devices & Circuits (BEC-15)
Contact hours/week	:	Lecture : 3, Tutorial : 1 , Practical: 2
Number of Credits	:	5
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce and Three Minor tests and One Major Theory & Practical Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Students will be able to learn about the operational amplifiers and its characteristics as well as various types of op-amps.
2. Students will acquire the ability to design and test practical circuits for amplifiers, filters and oscillators.
3. Students will be able to analyze the operation of comparators, data convertors and implementation of the same.
4. Students will be able to learn the functioning of PLL, VCO, V-I, I-V converters, AGC, AVC and analog multipliers and implement them for suitable applications

Topics Covered

UNIT-I	9
Introduction to Integrated Circuit Design: Power Supply configurations for Op-amp application, Various types of Op-amp, Current mirrors using BJT and MOSFETs, Base current compensated mirrors, Wilson current mirrors, Widlar current source.	
UNIT-II	9
Linear and Nonlinear applications of IC Op-amp: An overview of Op-amp, V-I and I-V converters, Log-antilog amplifiers, Precision rectifier, Peak detector, Sample and Hold Circuits, Analog multiplier and their applications, Op-amp as a comparator, Zero-crossing detector, Schmitt trigger, Astable and Monostable multivibrator using Op-Amp, Generation of triangular waveform	
UNIT-III	9
Filters: Characteristics of filters, Classification of filters, Butterworth filters, Chebyshev filters, Bessel filters, Low Pass and High Pass filters, Band Pass filters, Band reject filters, Notch filters.	
UNIT-IV	9
Advanced applications of an Op-amp : Frequency Divider, PLL IC, 555 IC timer, Design of Astable and Monostable Multivibrators using 555 Timer IC, Standard Regulator ICs and their characteristics.	

EXPERIMENTS

1. Study the characteristics of negative feedback amplifier
2. Design of an instrumentation amplifier
3. Design and test an astable multivibrator for a given frequency.
4. Study the characteristics of integrator circuit
5. Design of Analog filters – I
6. Design of Analog filters – II
7. Design of a self-tuned Filter
8. Design of a function generator
9. Design of a Voltage Controlled Oscillator
10. Design of a Phase Locked Loop(PLL)
11. Design and test an AGC system for a given peak amplitude of sine-wave output
12. Design of a low drop out regulator
13. Design of a switched mode power supply that can provide a regulated output voltage for a given input range using the TPS40200 IC

Books & References

1. Data Sheet: http://www.ti.com/lit/ds/symlink/tl082.pdf
2. Application Note: http://www.ti.com/lit/an/sloa020a/sloa020a.pdf
3. MPY634 Data Sheet: http://www.ti.com/lit/ds/symlink/mpy634.pdf
4. Application Note: http://www.ti.com/lit/an/sbfa006/sbfa006.pdf
5. ASLK Pro Manual: ASLK Manual
6. *Ramakant A. Gayakwad, "Op-amps and Linear Integrated Circuits", PHI*
7. *Millman and Grabel, "Microelectronics", 2nd Ed., Mcgraw Hill*
8. *D. Roy Chudhry, "Linear Integrated Circuits", New Age International*

BEC-41	VLSI DESIGN

Course category	:	Department Core (DC)
Pre-requisite Subject	:	Nil
Contact hours/week	:	Lecture : 3, Tutorial : 1 , Practical: 2
Number of Credits	:	5
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes and One Mid Semester and One Major Theory and Practical Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Able to understand the fundamentals of CMOS VLSI and associated technologies.
2. Able to solve problems in the design of CMOS logic circuits, with particular reference to speed and power consumption.
3. Able to acquire hands-on skills of using CAD tools in VLSI design.
4. Able to appreciate the design process in VLSI through a mini-project on the design of a CMOS sub system.
5. Able to explain basic operation principles of diodes and MOS transistors and their circuits level models
6. Able to design the fundamental blocks of a VLSI circuits, both by circuit schematic and physical layout.
7. Able to understand the VLSI Testing principles.

Topics Covered	Lectures
UNIT-I	8
Introduction: Trends & Projections in VLSI Circuits, Flow diagram of VLSI Circuit Design andVLSI Design issues, Y-Chart; Electrical Characterization of MOS transistor: Energy-band explanation for MOS structure, C-V characteristics of MOS Capacitor, Long-Channel and Short-Channel MOSFETs, Short-Channel effects, SPICE parameters of MOS transistor.	
UNIT-II	8
Basic VLSI Design Styles-NMOS, CMOS Process flow; n-MOS p-MOS and CMOS Inverter Design, Noise Margin, VTC curve, Delay computations, Power Dissipation and scaling in CMOS circuits; Combinational circuit design using nMOS, pMOS, CMOS & CMOS TG circuits.	
UNIT-III	8
Stick Diagrams; Physical Design Rules; Layout Designing; Euler's Rule for VLSI Physical Design.Dynamic CMOS circuits: Basic Principles of pass transistor and transmission gate, CMOS Transmission-Gate and Pass-transistor logic circuits, Domino CMOS Logic, NORA CMOS Logic, Zipper CMOS circuits, Basic BiCMOS Circuit behavior.	
UNIT-IV	8
Semiconductor Memories, ROM, DRAM and SRAM Cell Design; Introduction to VLSI testing- Principle of testing - types of testing - DC and AC parametric tests -	

fault modeling - Stuck-at fault - fault equivalence - fault collapsing - fault dominance - fault simulation.	

Experiments:

1. To design CMOS inverter and analyze DC and transient analysis.
2. To design a NOR gate and analyze transient analysis.
3. To design a NAND gate and analyze transient analysis.
4. To design a given Boolean expression and compare two logically equivalent circuit.
5. To perform (a) DC and (b) AC analysis of a common source amplifier by plotting V_{out} vs V_{in}. In case of AC analysis, calculate gain (gain=V_{out}/V_{in})
6. To find the AC gain in a cascode amplifier.
7. Implement and plot DC characteristics of the following current mirror circuits: (i) Basic current mirror (ii) Cascode current mirror
8. To design and simulate Full adder circuit using Verilog code.
9. To design and simulate "D" Flip Flop circuit using Verilog code.

Books & References

1. S.M Kang and Y.Leblebici, "CMOS Digital Integrated Circuits: Analysis and Design" TMH Publication.
2. Ben Streetman and Sanjay Bannerjee, "Solid State Electronic Devices" Pearson Education.
3. Neil H Weste and David Harris, CMOS VLSI Design: A Circuits and Systems Perspective, Prentice Hall of India.
4. Jan.M.Rabaey, A. Chandrakasan and B.Nikolic, "Digital Integrated Circuits" Pearson Education.
5. Doughlas Pucknell & Kamran Eshragian, "Basic VLSI Design" PHI Publication

BEC-43	WIRELESS COMMUNICATION	
Course category	:	Department Core (DC)
Pre-requisite Subject	:	Principles of Communication (BEC-28)
Contact hours/week	:	Lecture : 3, Tutorial : 1 , Practical: 0
Number of Credits	:	4
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes and Three Minor tests and One Major Theory Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Able to understand the Infrastructure to develop mobile communication system:cellular Theory.
2. Able to understand the characteristics of different multiple access techniques in mobile/wireless communication.
3. Able to understand the need of coding, channel models, diversity, equalization and channel estimation techniques.Able to apply analytical and empirical models in the design of wireless links.
4. Able to understand the Wireless communication systems and standards: GSM,IS-95.
5. Able to understand the Ad Hoc networks and new trends in Mobile/wireless communication.
6. Able to understand the radio propagation over wireless channel and different limitations.
7. Able to apply analytical and empirical models in the design of wireless links.

Topics Covered

UNIT-I	9
Evolution of mobile communications, Mobile Radio System around the world, Types of Wireless communication System, Comparison of Common wireless system, Trend in Cellular radio and personal communication. **Review of 2G, 3G, 4G and 5G Wireless Networks**, Wireless Local Loop(WLL), Wireless Local Area network(WLAN), Bluetooth and Personal Area Networks.	
UNIT-II	9
Fundamentals of equalisation, Equalisers in communication receiver, Survey of equalisation techniques, linear equaliser, Algorithms for Adaptive Equalization, Diversity techniques, RAKE receiver with its application. Characteristics of speech signals, quantisation techniques, vocoders, linear predictive coders, Multiple Access techniques for Wireless Communications.	
UNIT-III	9
Review of probability distribution function (PDF): Nakagami-m, Weibull distribution, Lognormal fading with application in realistic scenarios, Large scale path loss:-Free Space Propagation loss equation, Path-loss of NLOS and LOS systems, Reflection, Ray ground reflection model, Diffraction, Scattering,	

Link budget design, Max. Distance Coverage formula, Empirical formula for path loss, Indoor and outdoor propagation models, Small scale multipath propagation, Impulse model for multipath channel, Delay spread.	
UNIT-IV	9
GSM system architecture, Radio interface, Protocols, Localization and calling, Handover, Authentication and security in GSM, GSM speech coding, Concept of spread spectrum, Architecture of IS-95 CDMA system, Air interface, CDMA forward channels, CDMA reverse channels, Soft handoff, CDMA features, Power control in CDMA, Performance of CDMA System, RAKE Receiver, CDMA2000 cellular technology, GPRS system architecture. **Review of 4G and 5G networks and their comparative analysis, issues and challenges.**	

Books & References

1. T.S. Rappaport, "Wireless Communication-Principles and practice", Pearson, Second Edition.
2. T L Singal,"Wireless Communications ",McGraw Hill Publications.
3. Andrea Goldsmith, "Wireless Communications", Cambridge University press.
4. Andreas F. Molisch, "Wireless Communications", Wiley Student Edition.

S. Haykin& M. Moher, "Modern wireless communication", Pearson, 2005.

BEC-54	ADVANCED SEMICONDUCTOR DEVICES	
Course category	:	Programme Electives (PE1 & PE2)
Pre-requisite Subject	:	Solid State Devices & Circuits (BEC-15)
Contact hours/week	:	Lecture : 3, Tutorial : 1 , Practical: 0
Number of Credits	:	4
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes and Three Minor tests and One Major Theory Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Students study the basic of different kinds of modern semiconductor devices.
2. Ability to understand the basic operation and working of different diodes like PIN, IMPATT diodeetc. To understand the high frequency application of diodes.
3. To understand and use of the device models to explain and calculate the characteristics of the field effect transistors.
4. To be able to understand and analyze the V-I characteristics of different high power devices.
5. Understand the operation of charge-transfer devices and charge storage devices.

Topics Covered

UNIT-I	9
Review of Fundamentals of Semiconductors: Semiconductor Materials and their properties ,carrier transport by drift and diffusion, electron - hole pair generation and recombination: band to band (direct and indirect band gap transitions), continuity equations.	
UNIT-II	9
Junctions and Interfaces: Description of p-n junction, The Abrupt Junction, The linearly graded Junction, Description of Breakdown Mechanism, Zener and Avalanche Breakdown in p-n Junction. Special purpose diodes: P-I-N diode, IMPATT diode, TRAPATT diode, BARITT diode, Photo detectors: photoconductor, photodiodes, avalanche photodiode, phototransistor, charge-coupled device (CCD).	
UNIT-III	9
Majority Carrier Diodes: The Tunnel Diode, The Schottkey Barrier Diode, Ohmic Contacts Heterojunctions. Optoelectronic Devices: The Solar Cell:generation of photo voltage, light generated current, I-V equation, solar cell characteristics, parameters of solar cells,	

Relation of V_{oc} and E_g, light emitting diodes, semiconductor lasers.	
UNIT-IV	9
Metal Semiconductor Field Effect Transistors: Basic Types of MESFETs, Models for I-V Characteristics of Short – Channel MESFETs, tunnelling field-effect transistor (TFET), thin film transistor (TFT), JFET, high electron-mobility transistor (HEMT), modulation-doped FET (MODFET), single-electron transistor, floating gate MOSFET.	
Books & References	
1. M.S. Tyagi, "Introduction To Semiconductor Materials And Devices", John Willy-India Pvt. Ltd. 2. S. M. Sze, "Physics of Semiconductor Devices", 2nd Edition, John Willy-India Pvt. Ltd. 3. B. G. Streetman and S. Banerjee, "Solid state electronics devices", 5th Edition, PHI. 4. Solar Photovoltaics: Fundamentals, Technologies and Applications, C. S. Solanki, 2nd Edition Prentice Hall of India, 2011.	

BEC-58	FUNDAMENTAL OF SATELLITE COMMUNICATION	
Course category	:	Programme Electives (PE1 & PE2)
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture : 3, Tutorial : 1 , Practical: 0
Number of Credits	:	4
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes and One Minor tests and One Major Theory Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Revised the fundamentals of orbital mechanics, identify the characteristics of common orbits used by communications and other satellites.
2. Identify the Different elements used to design the earth station for satellite communication.
3. Identify the Different elements used to design the space station for satellite communication.
4. Calculate an accurate link budget design for the uplink and downlink in satellite communications link.

Topics Covered

UNIT-I	9
Evolution of satellite communication, Elements of Satellite Communication, Kepler laws, Orbital elements, Orbital perturbations, Apogee perigee heights, Inclines orbits, Sun synchronous orbits, Geo stationary orbits, Limits of visibility, Sun transit outage, polar Mount antenna, Antenna Look angles, Launching orbits, Low earth orbits, Medium orbits, satellite antenna.	
UNIT-II	9
Earth segment: Receive-Only Home TV Systems, Master Antenna TV System, Transmit-Receive Earth Stations, Introduction to GPS and VSAT system, GPS and VSAT Receiver Operation.	
UNIT-III	9
Space segment: power supply subsystem, attitude control, station keeping, thermal control, TT & C Subsystem, Transponders, Antenna subsystem.	
UNIT-IV	9
Satellite link design: basic transmission theory, system noise temperature and G/T ratio, Uplink and downlink design, design for specified C/N, Input and Output back Off, Propagation effects and their impact on satellite-earth links: attenuation and depolarization, atmospheric absorption, rain, cloud and ice effects etc.	

Books & References

1. B. Pratt, A. Bostian, "Satellite Communications", Wiley India.
2. D. Roddy, "Satellite Communications", TMH, 4th Ed.
3. S. D. Ilcev, "Global Mobile Satellite Communication", Springer
4. R. Pandya, "Mobile and Personal Communication Systems and Services ", PHI.

BEC-68	NEURAL NETWORKS	
Course category	:	Programme Electives (PE4)
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture : 3, Tutorial : 1 , Practical: 0
Number of Credits	:	4
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes and One Minor tests and One Major Theory Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. To study the role of neural networks in engineering, artificial intelligence, and cognitive modelling.
2. To study the learning process of the neural networks of increasing complexity and learning the generalization theory.
3. To study the single-layer perceptron and multi-layered architecture of the neural networks.
4. Ability to apply neural networks to particular applications, and to know what steps to take to improve the performance.

Topics Covered	
UNIT-I	
Introduction to neuralnetworks, human brain, biological neuron, models of neuron, signal flow graph of neuron, feedback, network architecture, knowledge representation, Artificial intelligence and neural networks.	9
UNIT-II	
Learning Process: Error correction learning, memory based learning, Hebbian learning, competitive learning, Boltzmann learning, learning with and without teacher, learning tasks, memory and adaptation. Artificial neurons, Neural networks and architectures, neuron signal function, mathematical preliminaries, Feed forward & feedback architecture.	9
UNIT-III	
Introduction to Rosenblatt's perceptron, perceptron learning algorithm, perceptron convergence theorem, Single-Layer Perceptron classifiers, LMS learning Algorithm, Back propagation and other learning algorithms Multi-layered architecture, structure growing algorithms, applications of feed forward neural networks.	9
UNIT-IV	
Applications of Neural Algorithms and Systems: Linear Programming Modelling Network, Character Recognition Networks, Neural Networks Control Applications, Networks for Robot Kinematics, Neural Networks for nanotechnology applications.	9

Books & References

1. Kumar Satish, "Neural Networks", TMH
2. Simon Haykin, "Neural Networks", PHI
3. J. M. Zurada, "Introduction to Artificial Neural Systems", Jaico Publishers, 3e.

BEC-29 ELECTRONIC MEASUREMENT & INSTRUMENTATION

Course category :	Department Core (DC)
Pre-requisite Subject :	NIL
Contact hours/week :	Lecture : 3, Tutorial : 1 , Practical: 2
Number of Credits :	5
Course Assessment methods:	Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce and One Minor tests and One Major Theory & Practical Examination

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Able to understand operation of different instruments.
2. Able to describe different terminology related to measurements.
3. Understand the principles of various types of transducers and sensors.
4. Basic concept of instrumentation and its industrial application and working & performances of different kind of measuring instruments.
5. Ability to analyze performance characteristics of measuring instruments.
6. Ability to know, working principle & Performances of different electrical transducers.
7. Ability to understand construction, principle of operation, working and applications of waveform analyzers and spectrum analyzers, CRO and other display devices.
8. Ability to understand principle of operation of telemetry system and data acquisition system.
9. Ability to understand principle of operation of process control system and its various Applications.

Topics Covered

UNIT-I **9L**

Qualities Measurements and Digital Display Devices: Performance Characteristics, Error in Measurement, Sources of Error, Arithmetic Mean, Deviation from the Mean, Average Deviation, Standard Deviation, Limiting Errors.

Digital Display Devices: LED, LCD, Gas Discharge Plasma Displays, Incandescent Display, LVD (Liquid Vapour Display), Printers, Digital Voltmeters, Spectrum Analyzer.

UNIT-II **9L**

Transducers: Introduction, Selection Parameters of Transducer, Resistive Transducer, Strain Gauges, Inductive Transducer, Differential Output Transducers, LVDT, Capacitive Transducer, Photo-electric Transducer, Photo cells, Photo-Voltaic Cell, Photo Transistors, Temperature Transducers, Mechanical Transducer.

UNIT-III **9L**

Data Acquisition and Conversion: Introduction, Objective of Data Acquisition System, Multichannel DAS, A/D and D/A converters using Op-Amp, Data Loggers, Electromechanical A/D Converter, Digital Transducer, Frequency Standards.

UNIT-IV **9L**

Measurement of Power and Frequency: Introduction, Power Measurement by Bolometer element, Bolometer Mount and Bolometer Bridge, Measurement of Power on a Transmission Line, Measurement of Microwave Frequencies, Resonant Coaxial Lines, Cavity Wave meter.

EXPERIMENTS

1. Study of semiconductor diode voltmeter and its us as DC average responding AC voltmeter.
2. Study of L.C.R. bridge and determination of the value of the given components.
3. Study of distortion factor meter and determination of the % distortion of the given oscillator.
4. Study of the transistor tester and determination of the parameters of the given transistors.
5. Study of the following transducer (i) PT-100 transducer (ii) J- type transducer (iii) K-type transducer (iv)Pressure transducer.
6. Measurement of phase difference and frequency using CRO (Lissajous figure)
7. Measurement of low resistance using Kelvin"s double bridge.
8. Radio Receiver Measurements

Books & References

1. H. S. Kalsi, "Electronic Instrumentation", 3rd Ed., McGraw Hill Education(India), 2015.
2. David A. Bell, "Electronic Instrumentation and Measurements", 3rd Ed., Oxford University Press, 2013.

Revised

BEC-42 DIGITAL SIGNAL PROCESSING

Course category	:	Department Core (DC)
Pre-requisite Subject	:	
Contact hours/week	:	Lecture : 3, Tutorial : 1 , Practical: 0
Number of Credits	:	4
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes and Three Minor tests and One Major Theory Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Able to analyze signals using the discrete Fourier transform (DFT).
2. Understand circular convolution, its relationship to linear convolution, and how circular convolution can be achieved via the discrete Fourier transform.
3. Able to understand the decimation in time and frequency FFT algorithms for efficient computation of the DFT.
4. Able to understand the characteristics of IIR and FIR filters and learn the design of infinite and finite impulse response filters for filtering undesired signals.
5. Able to implement digital filters in a variety of forms:-Direct form I &II, Parallel, Cascade and lattice structure.
6. Able to understand the finite word length effects.

Topics Covered

UNIT-I 9

Discrete Fourier Transforms: Definitions, Properties of the DFT, Circular Convolution, Linear Convolution

Fast Fourier Transform Algorithms: Introduction, Decimation in Time (DIT) Algorithm, Computational Efficiency, Decimation in Frequency (DIF) Algorithm.

UNIT-II 9

IIR Filter Design: Structures of IIR – Analog filter design – Discrete time IIR filter from analog filter – IIR filter design by Impulse Invariance, Bilinear transformation, Approximation of derivatives – (LPF, HPF, BPF, BRF) filter design using frequency translation.

UNIT-III 9

FIR Filter Design: Filter design using windowing techniques (Rectangular Window, Hamming Window, Hanning Window, Blackman Window, Kaiser Window), Frequency sampling technique.

UNIT-IV 9

Realization of Discrete Time Systems: FIR systems – Direct form, cascaded, parallel and lattice structures, IIR systems – Direct form, cascaded, parallel, lattice and lattice ladder structures

Finite Word length Effects: Quantization effect in filter coefficients, round-off effect in digital filters

Books & References

1. John G Prokias, Dimitris G Manolakis, "Digital Signal Processing", Pearson Education.
2. Oppenheim & Schafer, "Digital Signal Processing" PHI
3. Johnny R. Johnson, "Digital Signal Processing", PHI Learning Pvt Ltd., 2009.
4. S. Salivahanan, ""Digital Signal Processing" Mc Graw Hill Education

BOE-25	INDUSTRIAL INSTRUMENTATION	
Course category	:	Open Elective
Pre-requisite Subject	:	Nil
Contact hours/week	:	Lecture: 3, Tutorial:1 , Practical: 0
Number of Credits	:	4
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes and Minor tests andMajor Theory Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Understand the variety of applications including control, quality assurance, performance testing, design and research.
2. Able to provide a fundamental background in the theory of Industrial Instrumentation and measurement system performance.
3. Able to establish the physical principles and practical techniques used to measure those quantities most important for Instrumentation applications.
4. Able to acquire sound knowledge about various techniques used for the measurement of industrial parameters

Topics Covered	
UNIT-I	9
Introduction, static & dynamic Characteristics, Strain Gauge, Load Cell, Torque Measurement,Temperature measurements: RTD, Thermocouple and thermistor.	
UNIT-II	9
Flow Measurement,LVDT and capacitance sensors, Piezoelectric sensors: sensors and signal conditioning circuit.	
UNIT-III	9
Pressure and Low-pressure measurement,Opto-electronic sensors, Flapper-nozle, Problems and Solutions on Industrial Instrumentation.	
UNIT-IV	9
pH and viscosity measurement and its signal conditioning circuit,Bioprocess Instrumentation and dissolved oxygen sensors.	

Books & References

1. Alok Barua, *Fundamentals of Industrial Instrumentation*, Wiley India, New Delhi 2011.
2. Alok Barua, *Analog Signal Processing: Analysis and Synthesis*, Wiley India, New Delhi 2014.

NPTEL Online Courses*

1. Advanced Topics in Probability and Random Processes
2. Digital Image Processing
3. Fiber Optics Communication Systems and Techniques
4. Introduction to Wireless and Cellular Communications.
5. Microwave Theory and Techniques.
6. Op-Amp Practical Application: Design, Simulation and Implementation.
7. Principles of Signal Estimations for MIMO/OFDM Wireless Communication.
8. Semiconductor Devices and Circuits.
9. Principles of Digital Communication.
10. Physical Modelling for Electronics Enclosures using Rapid Prototyping.
11. Discrete Time Signal Processing.
12. Design of Photovoltaic Systems.

- All NPTL courses under Humanities and management category shall allow student to get relaxation under HSEE, OE and Audit course category.