REGULATION 2019

COURSE STRUCTURE

SYLLABUS

2 Years M.Tech Degree Programme

ELECTRONICS AND COMMUNICATION ENGINEERING

DEPARTMENT OF ELECTRONICS AND COMMUNICATIONENGINEERING

GIET UNIVERSITY, GUNUPUR – 765022, ODISHA

(Affiliated to Biju Patnaik University of Technology, Rourkela)

Accredited by NAAC with 'A' Grade with a CGPA of 3.28/4.00
Accredited by NBA

Regulation 2019

GIET UNIVERSITY, GUNUPUR 765022,ODISHA

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
M.TECH ECE (R-2019)

I SEMESTER

Sl No	Course type	Course Code	Course Name	L	T	P	C
1	PC	MECPC1010	Advanced Communication Networks	3	0	0	3
2	PC	MECPC1020	Wireless and Mobile Communication	3	0	0	3
3	PE	MECPE1031	Wireless Sensor Networks	3	0	0	3
		MECPE1032	Optical Networks				
		MECPE1033	Statistical Information Processing				
4	PE	MECPE1041	Cognitive Radio	3	0	0	3
		MECPE1042	RF and Microwave Circuit Design				
		MECPE1043	DSP Architecture				
5	MC	MECPE1050	Research Methodology and IPR	2	0	0	2
6	AU	MECAU1061	English for Research Paper Writing	2	0	0	0
		MECAU1062	Disaster Management				
		MECAU1063	Sanskrit for Technical Knowledge				
		MECAU1064	Value Education				
7	LAB I	MECPC1170	Advanced Communication Networks Lab	0	0	4	2
8	LAB II	MECPC1180	Wireless and Mobile Communication Lab	0	0	4	2
Total				16	0	8	**18**

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II SEMESTER

Sl. No	Course type	Course Code	Course Name	L	T	P	C
1	PC	MECPC2010	Antennas and Radiating Systems	3	0	0	3
2	PC	MECPC2020	Advanced Digital Signal Processing	3	0	0	3
3	PE	MECPE2031	Satellite Communication	3	0	0	3
		MECPE2032	Internet of Things				
		MECPE2033	Voice and data networks				
4	PE	MECPE2041	Markov Chain and Queuing System	3	0	0	3
		MECPE2042	MIMO System				
		MECPE2043	Programmable Networks – SDN, NFV				
5	AC	MECAU2051	Constitution of India	2	0	0	0
		MECAU2052	Pedagogy Studies				
		MECAU2053	Stress Management by Yoga				
		MECAU2054	Personality Development through Life Enlightenment Skills				
6	Lab III	MECPC2160	Antennas and Radiating Systems lab	0	0	4	2
7	Lab IV	MECPC2170	Advanced Digital Signal Processing Lab	0	0	4	2
8	Mini Project	MECPC2180	Mini Project	0	0	4	2
Total				14	0	12	**18**

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III SEMESTER

Sl. No	Course type	Course Code	Course Name	L	T	P	C
1	PE	MECPE3011	High-performance Networks	3	0	0	3
		MECPE3012	Pattern Recognition and Machinelearning				
		MECPE3013	Remote Sensing				
2	OE	MECOE3021	Business Analytics	3	0	0	3
		MECOE3022	Industrial Safety				
		MECOE3023	Operations Research				
		MECOE3024	Cost Management of Engineering Projects				
3	Project	MECES3130	Project – I	0	0	20	10
Total				6	0	20	**16**

IV SEMESTER

Sl. No	Course type	Course Code	Course Name	L	T	P	C
1	Project	MECES4110	Project Phase – II	--	--	32	16
Total				--	--	32	**16**

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SCHEME OF INSTRUCTION SUMMARY

SL. NO.	COURSE WORK - COURSES AREA	CREDITS / SEMESTER				TOTAL CREDITS	%
		I	II	III	IV		
1	Professional Core (PC)	6	6			12	18.18
2	Professional Electives (PE)	6	6	3		15	22.72
3	Open Electives (OE)			3		3	4.54
4	Thesis Work , Seminar and VIVA-VOICE	4	6	10	16	36	54.54
	TOTAL	**16**	**18**	**16**	**16**	**66**	**100**

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I SEMESTER

Sl No	Course type	Course Code	Course Name	L	T	P	C
1	PC	MECPC1010	Advanced Communication Networks	3	0	0	3
2	PC	MECPC1020	Wireless and Mobile Communication	3	0	0	3
3	PE	MECPE1031	Wireless Sensor Networks	3	0	0	3
		MECPE1032	Optical Networks				
		MECPE1033	Statistical Information Processing				
4	PE	MECPE1041	Cognitive Radio	3	0	0	3
		MECPE1042	RF and Microwave Circuit Design				
		MECPE1043	DSP Architecture				
5	MC	MECPE1050	Research Methodology and IPR	2	0	0	2
6	AU	MECAU1061	English for Research Paper Writing	2	0	0	0
		MECAU1062	Disaster Management				
		MECAU1063	Sanskrit for Technical Knowledge				
		MECAU1064	Value Education				
7	LAB I	MECPC1170	Advanced Communication Networks Lab	0	0	4	2
8	LAB II	MECPC1180	Wireless and Mobile Communication Lab	0	0	4	2
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Subject Code	Subject Name	L	T	P	C	QP
MECPC1010	**AdvancedCommunicationNetwork**	3	0	0	3	A
	SYLLABUS					

Unit 1: [8 Hours]

OverviewofInternet-Concepts,challengesand history.Overviewof-ATM.TCP/IP CongestionandFlowControl inInternet-ThroughputanalysisofTCPcongestioncontrol.TCPfor highbandwidthdelaynetworks.FairnessissuesinTCP.

Unit2: [10 Hours]

RealTimeCommunications over Internet. Adaptiveapplications.Latency andthroughput issues. IntegratedServices Model(intServ). ResourcereservationinInternet. RSVP, CharacterizationofTrafficbyLinearlyBounded Arrival Processes(LBAP).Leakybucket algorithmandits properties.

Unit3: [8Hours]

PacketSchedulingAlgorithms-requirements andchoices.Schedulingguaranteedservice connections.GPS,WFQandRateproportionalalgorithms.Highspeedschedulerdesign.Theory ofLatencyRateserversand delayboundsinpacketswitchednetworksforLBAPtraffic,ActiveQueueManagement-RED,WREDandVirtualclock.Control theoreticanalysisofactive queuemanagement

Unit4: [10 Hours]

IPaddresslookup-challenges. PacketclassificationalgorithmsandFlowIdentification-GridofTries,Crossproductingand controlledprefixexpansionalgorithms.

Unit 5: [10 Hours]

Admissioncontrolin Internet.ConceptofEffective bandwidth.Measurementbased admission control.DifferentiatedServicesinInternet(DiffServ).DiffServ architectureand framework

Unit6: [8 Hours]

IPV4,IPV6,IPtunnelling, IPswitchingandMPLS,Overviewof IPoverATMandits evolution to IP switching. MPLS architecture and framework. MPLS Protocols. Traffic engineeringissuesinMPLS.

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Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert//

Text Book:

- JeanWairandandPravinVaraiya,"HighPerformanceCommunicationsNetworks",2nd edition,2000.
- Jean Le Boudec and Patrick Thiran, "Network Calculus A Theory of Deterministic Queueing SystemsfortheInternet",SpringerVeriag,2001.
- ZhangWang,"InternetQoS",MorganKaufman,2001.

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Subject Code	Subject Name	L	T	P	C	QP
MECPC1020	**WirelessandMobileCommunication**	3	0	0	3	A
	SYLLABUS					

Unit 1: : [8 Hours]

Cellular Communication Fundamentals:Cellular system design, Frequency reuse, cell splitting,handoverconcepts,Cochannelandadjacentchannelinterference,interferencereduction, techniques andmethods toimprove cellcoverage,Frequencymanagementand channel assignment.GSM architectureandinterfaces,GSMarchitecturedetails,GSMsubsystems,GSM LogicalChannels,DataEncryptioninGSM,Mobility Management,CallFlowsinGSM.2.5G Standards:HighspeedCircuitSwitchedData(HSCSD),GeneralPacketRadioService(GPRS),2.75GStandards: EDGE,

Unit2: : [10 Hours]

Spectralefficiencyanalysisbased oncalculationsforMultipleaccess technologies:TDMA, FDMAandCDMA,Comparisonofthesetechnologiesbasedontheirsignalseparationtechniques, advantages, disadvantagesandapplicationareas.Wireless networkplanning(Link budget and power spectrumcalculations)

Unit3: : [8 Hours]

MobileRadioPropagation:Large ScalePathLoss,FreeSpacePropagationModel, Reflection,Ground Reflection (Two-Ray)Model,Diffraction,Scattering,PracticalLinkBudget DesignusingPathLossModels, Outdoor PropagationModels, IndoorPropagationModels, Signal PenetrationintoBuildings.SmallScaleFadingandMultipath Propagation,ImpulseResponse Model,MultipathMeasurements,ParametersofMultipathchannels,TypesofSmallScaleFading: TimeDelaySpread;Flat,Frequencyselective,DopplerSpread; FastandSlowfading.

Unit4: : [10 Hours]

Equalization, Diversity:Equalizersinacommunications receiver,Algorithmsforadaptive equalization,diversitytechniques,space,polarization,frequencydiversity, Interleaving.

Unit 5: : [10 Hours]

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Code Division Multiple Access: Introduction to CDMA technology, IS 95 system Architecture, Air Interface, Physical and logical channels of IS 95, Forward Link and Reverse link operation, Physical and Logical channels of IS 95 CDMA, IS 95 CDMA Call Processing, soft Handoff, Evolution of IS 95 (CDMA One) to CDMA 2000, CDMA 2000 layering structure and channels.

Unit 6: :   **[10 Hours]**

Higher Generation Cellular Standards:3G Standards: evolved EDGE, enhancements in 4G standard, Architecture and representative protocols, call flow for LTE, VoLTE, UMTS, introduction to 5G

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert//

Text Book:

- V.K.Garg, J.E.Wilkes, "Principle and Application of GSM", Pearson Education, 5th edition,2008.
- V.K.Garg,"IS-95CDMA&CDMA2000",PearsonEducation,4[th]edition,2009.
- T.S.Rappaport,"Wireless CommunicationsPrinciplesand Practice",2[nd]edition,PHI,2002.
- WilliamC.Y.Lee,"MobileCellularTelecommunications AnalogandDigitalSystems",2[nd]edition, TMH,1995.
- Asha Mehrotra, "A GSM   system Engineering" Artech House Publishers Bosten, London,1997.

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Subject Code	Subject Name	L	T	P	C	QP
MECPE1031	**WirelessSensorNetworks**	3	0	0	3	A
SYLLABUS						

Unit1: :   **[8 Hours]**

Introduction   andoverviewofsensornetworkarchitectureanditsapplications,sensor networkcomparisonwithAdHocNetworks,   Sensornode   architecture   withhardwareand software details.

Unit2: :   **[8 Hours]**

Hardware:Exampleslikemica2,micaZ,telosB,cricket,Imote2,tmote,btnode,andSun   SPOT, Software (OperatingSystems):tinyOS,MANTIS, Contiki,and RetOS.

Unit3: :   **[10 Hours]**

Programmingtools:C,nesC.Performancecomparison ofwirelesssensornetworks simulationand experimentalplatforms likeopensource(ns-2) and commercial(QualNet,Opnet)

Unit4: :   **[8 Hours]**

Overviewofsensornetworkprotocols(detailsofatleast2importantprotocol   perlayer): Physical,MACandrouting/Networklayerprotocols,nodediscovery   protocols,multi-hopand cluster based protocols, Fundamentals of802.15.4, Bluetooth, BLE (Bluetooth low energy), UWB.

Unit5: :   **[10 Hours]**

Data   disseminationandprocessing;differencescomparedwithotherdatabasemanagement systems,datastorage;queryprocessing.

Unit 6: :   **[8 Hours]**

Specialized features: Energy   preservationand efficiency; security challenges; fault-tolerance,IssuesrelatedtoLocalization,connectivity   andtopology,Sensordeployment mechanisms;coverageissues;sensorWeb;sensorGrid,   Openissuesforfuture   research,and Enablingtechnologiesinwirelesssensornetwork.

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Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert//

Text Book:
- H.KarlandA.Willig,"ProtocolsandArchitecturesforWirelessSensorNetworks",John Wiley&Sons,India,2012.
- C.S.Raghavendra,K.M.Sivalingam,andT.Znati,Editors,"WirelessSensorNetworks", SpringerVerlag,1stIndianreprint, 2010.
- F. Zhao and L. Guibas, "Wireless Sensor Networks: An Information Processing Approach", MorganKaufmann, 1stIndianreprint,2013.

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Subject Code	Subject Name	L	T	P	C	QP
MECPE1032	**OpticalNetworks**	3	0	0	3	A
	SYLLABUS					

Unit1: : [10 Hours]

SONET/SDH:opticaltransportnetwork,IP,routingandforwarding,multiprotocollabel switching.

Unit 2: : [8 Hours]

WDM network elements: optical line terminals and amplifiers, optical add/drop multiplexers, OADMarchitectures, reconfigurableOADM,opticalcrossconnects.

Unit 3: : [8 Hours]

Controland management: network management functions, optical layer services and interfacing,performanceandfaultmanagement,configurationmanagement,opticalsafety.

Unit4: : [10 Hours]

NetworkSurvivability:protectioninSONET/SDH&clientlayer,opticallayerprotection schemes

Unit 5: : [10 Hours]

WDM network design: LTD and RWA problems, dimensioning wavelength routing networks,statisticaldimensioning models

Unit6: : [8 Hours]

Accessnetworks:Opticaltimedivisionmultiplexing,synchronization,headerprocessing, buffering,burstswitching,testbeds,IntroductiontoPON, GPON,AON.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert//

Text Book:
- RajivRamaswami,Sivarajan,Sasaki,"OpticalNetworks:APracticalPerspective",MK, Elsevier,3 rdedition,2010.
- C.SivaRamMurthy andMohanGurusamy,"WDMOpticalNetworks:ConceptsDesign, andAlgorithms",PHI,EEE,2001

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Subject Code	Subject Name	L	T	P	C	QP
MECPE1033	**StatisticalInformationProcessing**	3	0	0	3	A
	SYLLABUS					

Unit1: :   **[10 Hours]**

Reviewof randomvariables:ProbabilityConcepts,distributionanddensityfunctions, moments, independent, uncorrelated and orthogonal random variables; Vector-space representationofRandomvariables,Vectorquantization, Tchebaychefinequalitytheorem,Central Limittheorem,Discrete&ContinuousRandomVariables.

Randomprocess: Expectations,Moments,Ergodicity,Discrete-TimeRandomProcessesStationary process,autocorrelation andautocovariancefunctions,Spectralrepresentationof randomsignals, Propertiesofpowerspectraldensity,GaussianProcessandWhitenoise process.

Unit2: :   **[8 Hours]**

Randomsignalmodelling:MA(q),AR(p),ARMA(p,q)models,HiddenMarkovModel&itsapplications ,LinearSystemwith randominput,ForwardandBackwardPredictions,Levinson DurbinAlgorithm.

Unit 3: :   **[8 Hours]**

Statistical Decision Theory: Bayes' Criterion, Binary Hypothesis Testing, M-ary Hypothesis Testing, Minimax Criterion, Neyman-Pearson Criterion, Composite Hypothesis Testing. ParameterEstimationTheory:MaximumLikelihoodEstimation,GeneralizedLikelihoodRatio Test ,Some Criteria for GoodEstimators, Bayes' Estimation Minimum Mean-SquareError Estimate,Minimum,MeanAbsoluteValueofErrorEstimateMaximumAPosteriori Estimate, Multiple ParameterEstimation BestLinearUnbiased Estimator ,Least-SquareEstimation RecursiveLeast-SquareEstimator.

Unit4::   **[8 Hours]**

Spectral analysis:Estimatedautocorrelation function,Periodogram,Averaging the periodogram (Bartlett Method), Welch modification, Parametric method, AR(p) spectral estimationanddetectionofHarmonicsignals.

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Unit5: : [8 Hours]

Information TheoryandSourceCoding:Introduction,Uncertainty,Informationand Entropy,Sourcecodingtheorem,Huffman,Shanon Fano,Arithmetic,Adaptivecoding,RLE, LZWDatacompaction,,LZ-77,LZ-78.DiscreteMemorylesschannels,Mutual information, channel capacity, Channel coding theorem, Differential entropyand mutual information for continuousensembles.

Unit6: : [10 Hours]

Application ofInformation Theory:Group,Ring&Field,Vector,GFaddition, multiplication rules.Introduction toBCHcodes,Primitiveelements,Minimalpolynomials, Generator polynomials in terms ofMinimal polynomials, Some examples ofBCH codes,&Decoder, Reed-Solomoncodes&Decoder,ImplementationofReed Solomonencodersand decoders.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert//

Text Book:

- PapoulisandS.U.Pillai,"Probability,RandomVariablesandStochasticProcesses",4thEdition, McGraw-Hill,2002.
- D.G. Manolakis, V.K. Ingle and S.M. Kogon, "Statistical and Adaptive Signal Processing",McGrawHill,2000.
- MouradBarkat,"SignalDetectionand Estimation", ArtechHouse,2nd Edition, 2005.
- RG.Gallager,"Informationtheoryand reliablecommunication", Wiley,1stedition,1968.
- F.J.MacWilliamsandN.J.A.Sloane,"TheTheoryofError-CorrectingCodes",New York,North-Holland,1977.
- RosenK.H,"ElementaryNumber Theory",Addison-Wesley,6thedition,2010.

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Subject Code	Subject Name	L	T	P	C	QP
MECPE1041	**CognitiveRadio**	3	0	0	3	A
SYLLABUS						

Unit1: :   **[10 Hours]**

Introduction   toCognitiveRadios:Digitaldividend,cognitiveradio(CR)architecture,   functionsof cognitiveradio,dynamicspectrumaccess(DSA),componentsof cognitiveradio, spectrumsensing, spectrumanalysisand decision,potentialapplicationsof cognitiveradio.

Unit2: :   **[8 Hours]**

Spectrum   Sensing:Spectrumsensing,detectionofspectrumholes(TVWS),collaborative sensing,geo-locationdatabaseandspectrumsharingbusinessmodels(spectrumofcommons,real timesecondaryspectrummarket).

Unit3: :   **[10 Hours]**

OptimizationTechniques   ofDynamicSpectrum   Allocation:Linearprogramming,convex programming,non-linearprogramming,integerprogramming,   dynamicprogramming,stochastic programming.

Unit4: :   **[8 Hours]**

DynamicSpectrumAccessandManagement:Spectrum   broker,cognitiveradio architectures,centralizeddynamicspectrumaccess,distributeddynamicspectrumaccess,learning algorithmsand protocols.

Unit5: :   **[8 Hours]**

Spectrum   Trading:Introductiontospectrumtrading,classificationtospectrum   trading, radioresourcepricing,briefdiscussion   oneconomics   theoriesinDSA(utility,auctiontheory), classificationofauctions(singleauctions,double auctions,concurrent,sequential).

Unit6::   **[8 Hours]**

Research   ChallengesinCognitiveRadio:Networklayerandtransportlayerissues,cross-

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layerdesignforcognitiveradionetworks.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert//

Text Book:
- EkramHossain,DusitNiyato,ZhuHan,"DynamicSpectrumAccessandManagementin Cognitive RadioNetworks",Cambridge UniversityPress,2009.
- Kwang-ChengChen,RamjeePrasad,"Cognitiveradionetworks",JohnWiley&Sons Ltd.,2009.
- Bruce Fette,"Cognitiveradio technology",Elsevier,2ndedition,2009.
- Huseyin Arslan, "Cognitive Radio, Software Defined Radio, and Adaptive Wireless Systems",Springer,2007.

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Subject Code	Subject Name	L	T	P	C	QP
MECPE1042	**RF andMicrowaveCircuitDesign**	3	0	0	3	A
	SYLLABUS					

Unit 1: :   **[10 Hours]**

TransmissionLine Theory:Lumped element circuit modelfor transmission line, field analysis, Smith chart, quarter wave transformer, generator and load mismatch, impedance matchingandtuning.

Unit2: :   **[10 Hours]**

Microwave NetworkAnalysis:Impedanceandequivalentvoltageandcurrent,Impedance andadmittancematrix, Thescatteringmatrix,transmission matrix,Signalflow graph.

Unit3: :   **[8 Hours]**

MicrowaveComponents: Microwaveresonators,Microwavefilters,powerdividersand directionalcouplers,Ferromagneticdevices andcomponents.

Unit4: :   **[8 Hours]**

NonlinearityAndTimeVarianceInter-symbolinterference,random process&noise, definitionofsensitivityanddynamicrange,conversiongainanddistortion.

Unit5: :   **[8 Hours]**

Microwave Semiconductor DevicesAndModeling:PINdiode,Tunneldiodes,Varactor diode,Schottkydiode,IMPATTandTRAPATTdevices,transferredelectron devices,Microwave BJTs,GaAs FETs,lownoise and powerGaAs FETs,MESFET,MOSFET,HEMT.

Unit6: :   **[8 Hours]**

AmplifiersDesign:Powergainequations,stability,impedancematching,constantgainand noisefigurecircles,smallsignal,lownoise,high   powerandbroadbandamplifier,oscillators, Mixersdesign.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert//

Text Book:
  • MatthewM.Radmanesh, "AdvancedRF &MicrowaveCircuit Design:TheUltimate

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GuidetoSuperiorDesign",AuthorHouse,2009.
- D.M.Pozar,"Microwave engineering" ,Wiley,4thedition,2011.
- R.Ludwigand P.Bretchko,"R.F.CircuitDesign",PearsonEducationInc,2009.
- D. Vendelin,A.M.Pavoi,U.L.Rohde,"MicrowaveCircuitDesignUsing LinearAnd NonLinearTechniques",JohnWiley1990.
- S.Y.Liao,"MicrowavecircuitAnalysisand AmplifierDesign",PrenticeHall1987.
- Radmanesh,"RFandMicrowaveElectronicsIllustrated",PearsonEducation,2004.

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M.TECH ECE (R-2019)

Subject Code	Subject Name	L	T	P	C	QP
MECPE1043	**DSP Architecture**	3	0	0	3	A
	SYLLABUS					

Syllabus Contents :

Unit1:   **[10 Hours]**

ProgrammableDSPHardware:ProcessingArchitectures(von   Neumann,Harvard),DSP corealgorithms(FIR,IIR,Convolution,   Correlation,FFT),IEEEstandardforFixedandFloating PointComputations,SpecialArchitectures ModulesusedinDigitalSignal Processors (like MAC unit,Barrelshifters),On-Chipperipherals,DSPbenchmarking.

Unit2::   **[8 Hours]**

Structural   andArchitectural   Considerations:ParallelisminDSPprocessing,Texas InstrumentsTMS320DigitalSignalProcessor Families,FixedPointTIDSPProcessors: TMS320C1X and TMS320C2X Family,TMS320C25 –Internal Architecture, Arithmetic and LogicUnit,Auxiliary Registers,AddressingModes(Immediate,DirectandIndirect,Bit-reverse Addressing),BasicsofTMS320C54xandC55xFamiliesinrespectofArchitectureimprovements andnewapplicationsfields,TMS320C5416DSPArchitecture,Memory   Map,InterruptSystem, PeripheralDevices,IllustrativeExamplesforassemblycoding.

Unit 3:   **[8 Hours]**

VLIW Architecture: Current DSP Architectures, GPUs as an   alternative to DSP Processors,TMS320C6XFamily,AddressingModes,ReplacementofMACunitbyILP,Detailed studyof   ISA,AssemblyLanguageProgramming,CodeComposerStudio,MixedCandAssembly Languageprogramming,On-chipperipherals, Simpleapplicationsdevelopments asanembedded environment.

Unit4:   **[8 Hours]**

Multi-coreDSPs:Introduction   toMulti-corecomputingandapplicabilityforDSP

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hardware,Conceptofthreads,introductiontoP-thread,mutexand similarconcepts,heterogeneous andhomogenousmulti-coresystems,SharedMemoryparallelprogramming–OpenMPapproach ofparallelprogramming,PRAGMAdirectives,OpenMPConstructsforworksharinglikefor loop,sections, TITMS320C6678(EightCoresubsystem).

Unit5:[8 Hours]

FPGAbased DSPSystems: LimitationsofP-DSPs,RequirementsofSignalprocessingfor CognitiveRadio(SDR),FPGAbasedsignalprocessingdesign-casestudyofacompletedesignof DSPprocessor.

Unit 6:   [10 Hours]

High Performance Computing using P-DSP: Preliminaries ofHPC, MPI, OpenMP, multicore DSPas HPCinfrastructure.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert//

Text Book:
- M. Sasikumar, D. Shikhare, Ravi Prakash, "Introduction to Parallel Processing", 1st Edition,PHI,2006.
- FayezGebali,"Algorithmsand ParallelComputing",1stEdition,JohnWiley&Sons,2011
- Rohit Chandra, Ramesh Menon, Leo Dagum, David Kohr, DrorMaydan, Jeff McDonald,"ParallelProgramminginOpenMP",1stEdition,MorganKaufman,2000.
- AnnMelnichuk,LongTalk,"MulticoreEmbeddedsystems",1stEdition,CRCPress,2010.
- WayneWolf,"HighPerformanceEmbeddedComputing:Architectures,Applicationsand Methodologies",1stEdition,MorganKaufman,2006.
- E.S.Gopi, "Algorithmic Collections for Digital Signal Processing Applications Using MATLAB",1stEdition,SpringerNetherlands,2007.

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M.TECH ECE (R-2019)

Subject Code	Subject Name	L	T	P	C	QP
MECPE1050	**ResearchMethodologyandIPR**	3	0	0	3	A
	SYLLABUS					

Unit1: [10 Hours]

Meaningof researchproblem,Sourcesofresearchproblem,CriteriaCharacteristicsof agoodresearchproblem,Errorsinselectingaresearch problem,Scope andobjectivesof researchproblem. Approaches ofinvestigationofsolutions for research problem, data collection, analysis, interpretation,Necessary instrumentations

Unit2:[8 Hours]

Effectiveliteraturestudies approaches, analysis Plagiarism, Research ethics,

Unit3:[8 Hours]

Effectivetechnicalwriting,howtowritereport,Paper,Developing aResearchProposal,Formatofresearchproposal,apresentation andassessment bya reviewcommittee

Unit4:[8 Hours]

NatureofIntellectualProperty:Patents,Designs,TradeandCopyright.Processof Patenting and Development: technological research, innovation, patenting, development. InternationalScenario:InternationalcooperationonIntellectualProperty.Procedureforgrants ofpatents,PatentingunderPCT.

Unit5:[8 Hours]

PatentRights:Scopeof PatentRights.Licensingandtransferof technology.Patent informationand databases.GeographicalIndications.

Unit6:[8 Hours]

NewDevelopmentsinIPR:Administration ofPatentSystem.Newdevelopmentsin IPR; IPRofBiologicalSystems,ComputerSoftwareetc.Traditional knowledgeCaseStudies, IPRand IITs.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert//

Text Book:
- StuartMelvilleandWayneGoddard,"Researchmethodology:anintroductionforscience

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&engineeringstudents'"

- Wayne GoddardandStuartMelville,"ResearchMethodology:AnIntroduction"
- Ranjit Kumar, 2 nd Edition , "Research Methodology: A Step by Step Guide for beginners"
- Halbert,"Resisting IntellectualProperty",Taylor&FrancisLtd,2007.
- Mayall,"IndustrialDesign",McGrawHill,1992.
- Niebel,"ProductDesign",McGrawHill,1974.
- Asimov,"IntroductiontoDesign",Prentice Hall,1962.

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Course Code	CourseName	L	T	P	C	QP
MECAU1061	**English for Research Paper Writing**	**2**	**0**	**0**	**0**	A
SYLLABUS						

Unit – I [8 Hours]
- Planning and Preparation, Word Order, Breaking up long sentences,
- Structuring Paragraphs and Sentences, Being Concise and Removing
- Redundancy, Avoiding Ambiguity and Vagueness`
- Clarifying Who Did What, Highlighting Your Findings, Hedging and
- Criticising, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction

Unit - II [4 Hours]
- Review of the Literature, Methods, Results, Discussion, Conclusions, The
- Final Check

Unit – III [4 Hours]
- key skills are needed when writing a Title, key skills are needed when
- writing an Abstract, key skills are needed when writing an Introduction,
- skills needed when writing a Review of the Literature,

Unit – IV [8 Hours]
- skills are needed when writing the Methods, skills needed when writing the
- Results, skills are needed when writing the Discussion, skills are neededwhen writing the Conclusions
- useful phrases, how to ensure paper is as good as it could possibly be the
- first- time submission

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Book:
1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book .
4. Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

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M.TECH ECE (R-2019)

Course Code	CourseName	L	T	P	C	QP
MECAU1062	**Disaster Management**	**2**	**0**	**0**	**0**	A
SYLLABUS						

Unit – I   **[8 Hours]**
Introduction
Disaster: Definition, Factors And Significance; Difference Between Hazard And Disaster; Natural And Manmade Disasters: Difference, Nature, Types And Magnitude.
Repercussions Of Disasters And Hazards: Economic Damage, Loss Of Human And Animal Life, Destruction Of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills,
Outbreaks Of Disease And Epidemics, War And Conflicts.

Unit - II   **[4 Hours]**
Disaster Prone Areas In India
Study Of Seismic Zones; Areas Prone To Floods And Droughts, Landslides And avalanches; Areas Prone To Cyclonic And Coastal Hazards With Special Reference To Tsunami; Post-Disaster Diseases And Epidemics

Unit – III   **[4 Hours]**
Disaster Preparedness And Management
Preparedness: Monitoring Of Phenomena Triggering A Disaster Or Hazard; Evaluation Of Risk: Application Of Remote Sensing, Data From Meteorological And Other Agencies, Media Reports: Governmental And Community Preparedness

Unit – IV   **[8 Hours]**
Risk Assessment
Disaster Risk: Concept And Elements, Disaster Risk Reduction, Global And National Disaster Risk Situation. Techniques Of Risk Assessment, Global Co- Operation In Risk Assessment And Warning, People's Participation In Risk Assessment. Strategies for Survival.
Disaster Mitigation
Meaning, Concept And Strategies Of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation And Non-Structural Mitigation, Programs Of Disaster Mitigation In India.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Book:
1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "'New Royal book Company.
2. Sahni, Pardeep Et.Al. (Eds.)," Disaster Mitigation Experiences And Reflections", Prentice Hall Of India, New Delhi.
3. Goel S. L. , Disaster Administration And Management Text And Case Studies" ,Deep &Deep Publication Pvt. Ltd., New Delhi.

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Course Code	CourseName	L	T	P	C	QP
MECAU1063	**Sanskrit for Technical Knowledge**	**2**	**0**	**0**	**0**	A
SYLLABUS						

Unit – I   **[8Hours]**
- Alphabets in Sanskrit,
- Past/Present/Future Tense,
- Simple Sentences

Unit - II   **[8 Hours]**
- Order
- Introduction of roots
- Technical information about Sanskrit Literature

Unit – III   **[10 Hours]**
- Technical concepts of Engineering-Electrical, Mechanical,Architecture, Mathematics

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Book:
1. "Abhyaspustakam" – Dr.Vishwas, Samskrita-Bharti Publication, New Delhi
2. "Teach Yourself Sanskrit" Prathama Deeksha-Vempati Kutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication
3. "India's Glorious Scientific Tradition" Suresh Soni, Ocean books (P) Ltd., New Delhi.

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Course Code	Course Name	L	T	P	C	QP
MECAU1064	**Value Education**	**2**	**0**	**0**	**0**	A
SYLLABUS						

Unit – I   **[4 Hours]**
- Values and self-development –Social values and individualattitudes. Work ethics, Indian vision of humanism.
- Moral and non- moral valuation. Standards and principles.
- Value judgements

Unit - II   **[6 Hours]**
- Importance of cultivation of values.
- Sense of duty. Devotion, Self-reliance. Confidence,
- Concentration. Truthfulness, Cleanliness.
- Honesty, Humanity. Power of faith, National Unity.
- Patriotism.Love for nature ,Discipline

Unit – III   **[8 Hours]**
- Personality and Behavior Development - Soul and Scientific
- attitude. Positive Thinking. Integrity and discipline
- Punctuality, Love and Kindness.
- Avoid fault Thinking.
- Free from anger, Dignity of labour.
- Universal brotherhood and religious tolerance.
- True friendship.
- Happiness Vs suffering, love for truth.
- Aware of self-destructive habits.
- Association and Cooperation.
- Doing best for saving nature

Unit – IV   **[8 Hours]**
- Character and Competence –Holy books vs Blind faith.
- Self-management and Good health.
- Science of reincarnation.
- Equality, Nonviolence, Humility, Role of Women.
- All religions and same message.
- Mind your Mind, Self-control.
- Honesty, Studying effectively

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Book:

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1 Chakroborty, S.K. "Values and Ethics for organizations Theory and practice", Oxford University Press, New Delhi

Course Code	CourseName	L	T	P	C	QP
MECPC1170	**AdvancedCommunicationNetworksLaboratory**	0	0	4	2	A
LIST OF EXPERIMENTS						

1. StudyofNetworkingCommands(Ping,Tracert,TELNET,nslookup,netstat,ARP,RARP) andNetworkConfigurationFiles.

2. LinuxNetworkConfiguration.

    ConfiguringNIC'sIPAddress.

    b. DeterminingIPAddressand MACAddressusingif-configcommand.

    c. ChangingIPAddressusingif-config.

    d. Static IPAddressand ConfigurationbyEditing.

    e. DeterminingIPAddressusingDHCP.

    f. ConfiguringHostnamein/etc/hostsfile.

3. DesignTCPiterativeClientandServerapplicationtoreversethegiveninputsentence.

4. DesignaTCPconcurrentServertoconvertagiventextintouppercaseusingmultiplexing systemcall"select".

5. DesignUDP ClientServertotransferafile.

6.   ConfigureaDHCPServertoservecontiguousIPaddressestoapooloffourIPdevices with adefaultgateway andadefaultDNSaddress.IntegratetheDHCPserverwitha BOOTPdemontoautomaticallyserveWindowsandLinux OSBinariesbased onclient MACaddress.

    a.   Configure DNS:MakeacachingDNSclient,andaDNSProxy;implementreverse DNSandforwardDNS,using TCPdump/Wiresharkcharacterisetrafficwhen the DNSserveris up and whenitis down.

7. Configurea mailserverforIMAP/POPprotocolsandwriteasimpleSMTPclient in

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C/C++/Javaclienttosend andreceivemails.

8. ConfigureFTP Server ona Linux/Windowsmachine usinga FTP client/SFTPclient characterisefiletransferrateforaclusterofsmallfiles100keachandavideofileof 700mb.Usea TFTPclientandrepeattheexperiment.

9. SignalingandQoSoflabeledpathsusingRSVPinMPLS.

10.Find shortest pathsthroughprovidernetworkforRSVPandBGP.

11.Understandconfiguration,forwardingtables, and debuggingofMPLS.

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Course Code	CourseName	L	T	P	C	QP
MECPC1180	**Wireless and Mobile Communication Laboratory**	0	0	4	2	A
LIST OF EXPERIMENTS							

1. UnderstandingCellularFundamentalslikeFrequencyReuse,Interference,cellsplitting, multipathenvironment,CoverageandCapacityissuesusingcommunicationsoftware.

2. KnowingGSMandCDMAarchitecture,networkconcepts,callmanagement,callsetup, callrelease,Securityand PowerControl, HandoffProcessandtypes,RakeReceiveretc.

3. StudyofGSMhandsetforvarioussignallingandfaultinsertiontechniques(MajorGSM handsetsections: clock,SIMcard,charging, LCDmodule,Keyboard, Userinterface).

4. Tostudytransmittersandreceiversectioninmobilehandsetandmeasurefrequencyband signalandGMSK modulatingsignal.

5. TostudyvariousGSMATCommandstheiruseanddevelopingnewapplicationusingit.Understatingof 3GCommunicationSystemwithfeatureslike;transmissionofvoiceand videocalls,SMS,MMS,TCP/IP,HTTP,GPSandFilesystembyATCommandsin3Gnetwork.

6. StudyofDSSStechniqueforCDMA,observeeffectofvariationoftypesofPNcodes,

7. Tolearnand developconceptsofSoftware Radioinrealtimeenvironmentbystudyingthe buildingblockslikeBasebandandRFsection,convolutionencoder,InterleaverandDe- Interleaver.

8.Tostudyandanalyze differentmodulationtechniquesintimeandfrequencydomainusing SDR kit.

II SEMESTER

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Sl. No	Course type	Course Code	Course Name	L	T	P	C
1	PC	MECPC2010	Antennas and Radiating Systems	3	0	0	3
2	PC	MECPC2020	Advanced Digital Signal Processing	3	0	0	3
3	PE	MECPE2031	Satellite Communication	3	0	0	3
		MECPE2032	Internet of Things				
		MECPE2033	Voice and data networks				
4	PE	MECPE2041	Markov Chain and Queuing System	3	0	0	3
		MECPE2042	MIMO System				
		MECPE2043	Programmable Networks – SDN, NFV				
5	AC	MECAU2051	Constitution of India	2	0	0	0
		MECAU2052	Pedagogy Studies				
		MECAU2053	Stress Management by Yoga				
		MECAU2054	Personality Development through Life Enlightenment Skills				
6	Lab III	MECPC2160	Antennas and Radiating Systems lab	0	0	4	2
7	Lab IV	MECPC2170	Advanced Digital Signal Processing Lab	0	0	4	2
8	Mini Project	MECPC2180	Mini Project	0	0	4	2
Total				14	0	12	**18**

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Subject Code	Subject Name	L	T	P	C	QP
MECPC2010	**AntennasandRadiatingSystems**	3	0	0	3	A
	SYLLABUS					

Unit 1: :   **[8 Hours]**

Types of Antennas: Wire antennas, Aperture antennas, Micro strip antennas, Array antennasReflectorantennas,Lensantennas,RadiationMechanism,Currentdistribution onthin wireantenna.Fundamental
ParametersofAntennas:RadiationPattern,RadiationPowerDensity,Radiation
Intensity,Directivity,Gain,Antennaefficiency,Beamefficiency,Bandwidth, Polarization,Input Impedance,radiation efficiency,AntennaVectoreffectivelength,FriisTransmission equation, AntennaTemperature.

Unit2: :   **[4 Hours]**

LinearWireAntennas:Infinitesimal dipole,Smalldipole,Regionseparation,Finitelength dipole,halfwavedipole,Groundeffects.

LoopAntennas:SmallCircularloop,CircularLoop of constantcurrent,Circularloopwithnon uniformcurrent.

Unit3: :   **[10 Hours]**

LinearArrays: Twoelementarray,NElementarray: UniformAmplitudeandspacing, BroadsideandEndfire array, Superdirectivity,Planararray,Designconsideration.

Unit 4: :   **[8 Hours]**

Aperture Antennas: Huygen's Field Equivalence principle, radiation equations, RectangularAperture,CircularAperture.HornAntennas:E-Plane,H-planeSectoralhorns, Pyramidaland Conicalhorns.

Unit5: :   **[4 Hours]**

MicrostripAntennas:BasicCharacteristics,Feedingmechanisms,Methodofanalysis, Rectangular Patch,CircularPatch.

Unit6: :   **[8 Hours]**

ReflectorAntennas:Planereflector,parabolicreflector,Cassegrainreflectors, Introduction toMIMO

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Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert//

Text Book:
- ConstantineA.Balanis,"AntennaTheoryAnalysisandDesign",JohnWiley&Sons,4th edition,2016.
- JohnDKraus,RonaldJMarhefka,AhmadSKhan,"AntennasforAllApplications",TataMcGraw-Hill,2002.
- R.C.Johnsonand H.Jasik,"AntennaEngineeringhandbook", Mc-GrawHill,1984.
- I.J.Bhaland P.Bhartia,"Micro-stripantennas",Artechhouse, 1980.

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Subject Code	Subject Name	L	T	P	C	QP
MECPC2020	**AdvancedDigitalSignal Processing**	3	0	0	3	A
	SYLLABUS					

Unit1: :   **[8 Hours]**

OverviewofDSP,Characterizationintimeandfrequency,FFTAlgorithms,Digitalfilter design andstructures:BasicFIR/IIRfilterdesign&structures,design techniquesoflinearphase FIRfilters,IIRfiltersbyimpulseinvariance,bilineartransformation, FIR/IIRCascadedlattice structures,parallelrealizationofIIR.

Unit2:   **[10 Hours]**

Multi rateDSP,DecimatorsandInterpolators,Samplingrateconversion,multistage decimator&interpolator,poly phasefilters,QMF, digitalfilterbanks,Applicationsinsubband coding.

Unit3: :   **[8 Hours]**

Linearprediction&optimumlinearfilters,stationaryrandom process,forward-backward linearpredictionfilters,solution ofnormalequations,ARLatticeandARMALattice-Ladder Filters,WienerFiltersfor Filtering and Prediction.

Unit 4: :   **[6 Hours]**Adaptive Filters, Applications, Gradient Adaptive Lattice, Minimum mean square criterion,LMSalgorithm, RecursiveLeastSquarealgorithm

Unit 5: :   **[8 Hours]**

EstimationofSpectra fromFinite-DurationObservationsofSignals. Nonparametric MethodsforPowerSpectrum Estimation,ParametricMethodsforPowerSpectrum Estimation, Minimum-VarianceSpectralEstimation,EigenanalysisAlgorithmsfor SpectrumEstimation.

Unit6: :   **[4 Hours]**

ApplicationofDSP&Multi   rateDSP,ApplicationtoRadar,introduction   towavelets, applicationtoimageprocessing,designof   phaseshifters,DSPinspeechprocessing&   other

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applications

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert//

Text Book:
- J.G.Proakisand D.G.Manolakis"Digitalsignalprocessing: Principles, Algorithmand Applications", 4thEdition,Prentice Hall,2007.
- N.J.Fliege,"MultirateDigitalSignalProcessing: MultirateSystems-FilterBanks– Wavelets",1stEdition,JohnWileyandSonsLtd,1999.
- BruceW.Suter,"MultirateandWaveletSignalProcessing",1st Edition,AcademicPress 1997.
- M.H.Hayes,"StatisticalDigitalSignalProcessingandModeling",JohnWiley&Sons Inc.,2002.
- S.Haykin,"Adaptive FilterTheory",4thEdition,Prentice Hall,2001.

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Subject Code	Subject Name	L	T	P	C	QP
MECPE2031	**SatelliteCommunication**	3	0	0	3	A
	SYLLABUS					

Unit1: : [8 Hours]

Architecture of SatelliteCommunicationSystem:Principlesandarchitectureof satellite Communication,Briefhistory ofSatellitesystems,advantages,disadvantages,applications,and frequencybandsusedforsatellitecommunicationandtheiradvantages/drawbacks.

Unit 2: : [6 Hours]

Orbital Analysis: Orbitalequations, Kepler's laws ofplanetary motion, Apogee and Perigeeforanellipticalorbit,evaluationofvelocity,orbital period,angularvelocityetcofa satellite,conceptsofSolardayand Siderealday.

Unit3: : [4 Hours]

Satellitesub-systems:ArchitectureandRolesofvarious sub-systemsofasatellitesystem such asTelemetry,tracking,commandandmonitoring(TTC&M),Attitudeand orbitcontrol system(AOCS),Communicationsub-system,powersub-systems, antenna sub-system.

Unit4: : [8 Hours]

Typical PhenomenainSatelliteCommunication:SolarEclipseonsatellite,itseffects, remediesforEclipse,Sun TransitOutagephenomena,its effectsandremedies,Dopplerfrequency shiftphenomenaandexpressionforDoppler shift.

Unit5: : [10 Hours]

Satellitelinkbudget:Fluxdensity andreceivedsignalpowerequations,Calculation of Systemnoisetemperatureforsatellitereceiver,noisepowercalculation,Drafting ofsatellitelink budget andC/N ratio calculationsin clear air andrainyconditions,CasestudyofPersonal Communicationsystem(satellitetelephony)usingLEO.

Unit6: : [8 Hours]

Modulation andMultipleAccessSchemesusedinsatellitecommunication.Typicalcase studies

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M.TECH ECE (R-2019)

ofVSAT,DBS-TVsatellitesandfewrecentcommunicationsatelliteslaunchedbyNASA/ ISRO.GPS.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert//

Text Book:
- TimothyPrattandOthers,"SatelliteCommunications",WileyIndia,2ndedition,2010
- S.K.Raman,"FundamentalsofSatelliteCommunication", PearsonEducationIndia,2011
- TriT.Ha, "DigitalSatelliteCommunications",TataMcGrawHill,2009.
- DennisRoddy,"SatelliteCommunication", McGrawHill,4thEdition,2008

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M.TECH ECE (R-2019)

Subject Code	Subject Name	L	T	P	C	QP
MECPE2032	**Internet of Things**	3	0	0	3	A
	SYLLABUS					

Unit1: :   **[8 Hours]**

SmartcitiesandIoTrevolution,Fractalcities,From   ITtoIoT,M2Mandpeernetworking concepts,Ipv4andIPV6.

Unit2: :   **[6 Hours]**

SoftwareDefinedNetworksSDN,From   CloudtoFogandMISTnetworkingforIoT communications,Principlesof   Edge/P2Pnetworking,ProtocolstosupportIoTcommunications, modular designandabstraction, securityand privacyinfog.

Unit3: :   **[10 Hours]**

Wirelesssensornetworks:introduction,IOTnetworks   (PAN,LANandWAN),Edge resourcepoolingandcaching,clientsidecontroland configuration.

Unit4: :   **[4 Hours]**

Smartobjectsasbuildingblocksfor IoT,   OpensourcehardwareandEmbeddedsystems platformsforIoT,Edge/gateway,IOdrivers, CProgramming,multithreadingconcepts.

Unit5: :   **[8 Hours]**

OperatingsystemsrequirementofIoTenvironment,study   ofmbed,RIoT,andContiki operatingsystems,Introductoryconceptsofbigdatafor IoTapplications.

Unit6: :   **[8 Hours]**

ApplicationsofIoT,Connectedcars   IoTTransportation,SmartGridandHealthcaresectors usingIoT,Securityandlegalconsiderations, ITAct2000andscope for IoTlegislation.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert//

Text Book:
- ABahaga,V.Madisetti,"Internet ofThings- Handsonapproach",VPTpublisher,2014.
- McEwen,H.Cassimally,"DesigningtheInternetofThings",Wiley,2013.
- CunoPfister,"Getting startedwithInternetofThings",Maker Media,1[st]edition,2011.

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- SamuelGreenguard,"Internet ofthings",MITPress,2015.

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M.TECH ECE (R-2019)

Subject Code	Subject Name	L	T	P	C	QP
MECPE2033	**VoiceandDataNetworks**	3	0	0	3	A
	SYLLABUS					

Unit1::   **[8 Hours]**

NetworkDesign Issues,Network Performance Issues,NetworkTerminology,centralized anddistributedapproachesfornetworksdesign, Issuesindesignofvoice and datanetworks.

Unit2: :   **[10 Hours]**

LayeredandLayerlessCommunication,CrosslayerdesignofNetworks,VoiceNetworks (wiredand wireless)and Switching, CircuitSwitching and PacketSwitching,Statistical Multiplexing.

Unit 3: :   **[6 Hours]**

Data Networks and their Design, Link layer design- Link adaptation, Link Layer Protocols, Retransmission. Mechanisms (ARQ),HybridARQ (HARQ),GoBackN,Selective Repeatprotocolsandtheiranalysis.

Unit4::   **[6 Hours]**

QueuingModelsofNetworks,TrafficModels,Little'sTheorem,Markovchains,M/M/1 and other Markov systems, Multiple Access Protocols , Aloha System , Carrier Sensing , ExamplesofLocalareanetworks,

Unit5: :   **[8 Hours]**

Inter-networking,Bridging,GlobalInternet,IPprotocol andaddressing,Subnetting, Classless InterdomainRouting(CIDR),IPaddresslookup,RoutinginInternet.   EndtoEnd Protocols,TCPandUDP.CongestionControl ,AdditiveIncrease/MultiplicativeDecrease,Slow Start, FastRetransmit/FastRecovery,

Unit6::   **[6 Hours]**

Congestionavoidance,REDTCPThroughputAnalysis,QualityofServiceinPacket
Networks.Network Calculus,PacketSchedulingAlgorithms

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert//

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Text Book:

- D.BertsekasandR.Gallager,"DataNetworks",2nd Edition,Prentice Hall,1992.
- L.PetersonandB.S.Davie,"ComputerNetworks:ASystemsApproach",5th Edition, MorganKaufman,2011.
- Kumar,D.ManjunathandJ.Kuri,"CommunicationNetworking:Ananalyticalapproach",1st Edition,MorganKaufman,2004.
- Walrand,"CommunicationsNetwork: AFirstCourse",2nd Edition,McGrawHill,2002.
- LeonardKleinrock,"QueueingSystems,VolumeI:Theory",1st Edition,JohnWileyand Sons,1975.
- AaronKershenbaum,"TelecommunicationNetworkDesignAlgorithms",McGrawHill,1993.
- VijayAhuja,"DesignandAnalysisofComputerCommunicationNetworks",McGrawHill,1987

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Subject Code	Subject Name	L	T	P	C	QP
MECPE2041	**MarkovChains andQueueingSystems**	3	0	0	3	A
SYLLABUS						

Unit1: : [8 Hours]

Introduction:Reviewofbasicprobability,propertiesofnonnegativerandomvariables, laws oflargenumbersand theCentralLimitTheorem.

Unit 2: : [6 Hours]

Renewal Processes: Basic definitions, recurrence times, rewards and renewalreward theorem,pointprocesses,Poissonprocess,Waldsequation, Blackwell'stheorem.

Unit3: : [10 Hours]

DiscretetimeMarkov chains:definitionsandproperties,matrixrepresentation,Perron-Frobeniustheory.

Unit4: : [8 Hours]

Continuous timeMarkovchains:basicdefinitions,Q-matrix,birth-deathprocesses,quasi birthdeathprocesses.;EmbeddedMarkov processes,semiMarkov processes,reversibleMarkov chains,Randomwalks.

Unit5: : [6 Hours]

Fundamentalqueuing results:Little's theorem,invarianceofthemeandelay,Conservation law.

Markovianqueues:JacksonandBCMPnetworks,numericalAlgorithms.M/G/1&G/M/1queues andG/G/1queues.

Unit6: : [8 Hours]

Advancedqueuingmodels:priority,vacationandretrialsinqueues.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert//

Text Book:
- Cliffs,"Stochastic Modellingand theTheoryQueues",Prentice Hall,1989.

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- P.Bremaud,"MarkovChains",Springer-Verlag,1999.
- E.Seneta,"NonNegativeMatricesand MarkovChains",SpringerSeries inStatistics, Springer,1981.
- R.Gallager,"DiscreteStochastic Processes",KluwerAcademicPress,1996.
- L.Kleinrock,"QueuingSystems",volsIandII,JohnWileyand Sons1976.

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M.TECH ECE (R-2019)

Subject Code	Subject Name	L	T	P	C	QP
MECPE2042	**MIMOSystems**	3	0	0	3	A
	SYLLABUS					

Unit 1: :   **[10 Hours]**

Introductionto Multi-antenna Systems, Motivation, Types of multi-antenna systems, MIMOvs.multi-antennasystems.

Unit2: :   **[8 Hours]**

Diversity,Exploitingmultipath   diversity,Transmitdiversity,Space-timecodes,The Alamoutischeme,Delaydiversity,Cyclicdelaydiversity,Space-frequency codes,Receive diversity, Therakereceiver,Combiningtechniques,SpatialMultiplexing,Spectral   efficiencyand capacity,Transmittingindependentstreamsinparallel,Mathematical notation

Unit3::   **[6 Hours]**

ThegenericMIMOproblem,   SingularValueDecomposition,Eigenvalues   and eigenvectors,EqualisingMIMOsystems,Disadvantagesof   equalisingMIMOsystems,Pre-distortioninMIMOsystems,Disadvantagesof   pre-distortioninMIMOsystems,Pre-coding   and combininginMIMOsystems,Advantagesof   pre-codingandcombining,Disadvantagesof   pre-coding and combining, Channelstateinformation.

Unit4:   **[8 Hours]**

Codebooks   forMIMO,Beamforming,Beamformingprinciples,Increasedspectrum   efficiency, Interference   cancellation,Switchedbeamformer,Adaptivebeamformer,Narrowband beamformer,Widebandbeamformer

Unit5: :   **[6 Hours]**

Casestudy:MIMOinLTE,Codewords   tolayersmapping,Pre-codingforspatial   multiplexing,Pre-codingfortransmit diversity, BeamforminginLTE, Cyclic delaydiversity basedpre-coding,Pre-codingcodebooks,Propagation   Channels,Time&frequencychannel dispersion,AWGNandmultipath   propagationchannels,Delayspreadvaluesandtimevariations, Fast andslow fadingenvironments,Complexbaseband multipathchannels, Narrowbandand

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widebandchannels,MIMOchannelmodels

Unit6: :   **[6 Hours]**

Channel   Estimation,Channelestimationtechniques,Estimationandtracking,Training basedchannelestimation,Blindchannel estimation,Channel estimationarchitectures,Iterative channel   estimation,MMSEchannelestimation,Correlative   channelsounding,Channel estimation in single carriersystems,ChannelestimationforCDMA,ChannelestimationforOFDM.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert//

Text Book:
- ClaudeOestges,BrunoClerckx,"MIMOWirelessCommunications:FromReal-worldPropagationtoSpace-time CodeDesign",Academic Press,1ˢᵗedition,2010.
- Mohinder Janakiraman, "Space - Time Codes and MIMO Systems", Artech HousePublishers,2004.

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Subject Code	Subject Name	L	T	P	C	QP
MECPE2043	**ProgrammableNetworks-SDN, NFV**	3	0	0	3	A
	SYLLABUS					

Unit1: :   **[10 Hours]**

IntroductiontoProgrammableNetworks,Historyand EvolutionofSoftwareDefined Networking(SDN), FundamentalCharacteristicsofSDN,SeparationofControlPlaneandData Plane,ActiveNetworking.

Unit2: :   **[8 Hours]**

ControlandDataPlaneSeparation:Concepts,AdvantagesandDisadvantages,thebasics ofOpenFlowprotocol.

Unit 3 : :   **[8 Hours]**

Network Virtualization: Concepts, Applications, Existing Network Virtualization Framework,MininetAsimulationenvironmentforSDN.

Unit 4 : :   **[6 Hours]**

Control Plane: Overview, Existing SDN Controllers including Floodlight and OpenDaylightprojects.Customization ofControl Plane:SwitchingandFirewallImplementation usingSDNConcepts.DataPlane:Software-based andHadrware-based;ProgrammableNetwork Hardware.

Unit5: :   **[6 Hours]**

ProgrammingSDNs:NorthboundApplicationProgrammingInterface,CurrentLanguages andTools,CompositionofSDNs.NetworkFunctions Virtualization(NFV)andSoftwareDefined Networks: Concepts,ImplementationandApplications.

Unit6: :   **[6 Hours]**

DataCenterNetworks:Packet,OpticalandWirelessArchitectures,Network Topologies. UseCasesof SDNs:DataCenters,InternetExchangePoints,BackboneNetworks,Home

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M.TECH ECE (R-2019)

Networks,Traffic Engineering.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert//

Text Book:
- ThomasD.Nadeau, KenGray, "SDN: SoftwareDefinedNetworks,AnAuthoritative ReviewofNetworkProgrammabilityTechnologies",O'Reilly Media,August2013.
- Paul Goransson, Chuck Black, Timothy Culver. "Software Defined Networks: A ComprehensiveApproach", MorganKaufmannPublishers,2016.
- FeiHu,"NetworkInnovationthroughOpenFlowandSDN:PrinciplesandDesign ",CRC Press, 2014.
- VivekTiwari, "SDNandOpenFlowforBeginners",Amazon DigitalServices,Inc., ASIN:,2013.
- NickFeamster,JenniferRexfordandEllenZegura,"TheRoadtoSDN:AnIntellectualHistoryof ProgrammableNetworks"ACMCCRApril2014.

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M.TECH ECE (R-2019)

Course Code	CourseName	L	T	P	C	QP
MECAU2051	**Constitution of India**	**2**	**0**	**0**	**0**	A

SYLLABUS

Unit – I   **[10 Hours]**
- History of Making of the Indian Constitution:History`Drafting Committee, (Composition & Working)
- Philosophy of the Indian Constitution:PreambleSalient Features

Unit - II   **[6 Hours]**
- **Contours of Constitutional Rights & Duties:**
- Fundamental Rights
- Right to Equality
- Right to Freedom
- Right against Exploitation
- Right to Freedom of Religion
- Cultural and Educational Rights
- Right to Constitutional Remedies
- Directive Principles of State Policy
- Fundamental Duties.

Unit – III   **[8 Hours]**
- **Organs of Governance:**
- Parliament
- Composition
- Qualifications and Disqualifications
- Powers and Functions
- Executive
- President
- Governor
- Council of Ministers
- Judiciary, Appointment and Transfer of Judges, Qualifications
- Powers and Functions

Unit – IV   **[10 Hours]**
- **Local Administration:**
- District's Administration head: Role and Importance,
- Municipalities: Introduction, Mayor and role of Elected Representative,
- CEO of Municipal Corporation.
- Pachayati raj: Introduction, PRI: Zila Pachayat.
- Elected officials and their roles, CEO Zila Pachayat: Position and role.

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- Block level: Organizational Hierarchy (Different departments),
- Village level: Role of Elected and Appointed officials,
- Importance of grass root democracy
- Election Commission: Role and Functioning.
- Chief Election Commissioner and Election Commissioners.
- State Election Commission: Role and Functioning.
- Institute and Bodies for the welfare of SC/ST/OBC and women

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Book:

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

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M.TECH ECE (R-2019)

Course Code	CourseName	L	T	P	C	QP
MECAU2052	**Pedagogy Studies**	**2**	**0**	**0**	**0**	A

SYLLABUS

Unit – I [8 Hours]

Introduction and Methodology:
- Aims and rationale, Policy background, Conceptual framework andterminology
- Theories of learning, Curriculum, Teacher education.
- Conceptual framework, Research questions.
- Overview of methodology and Searching.
- Thematic overview: Pedagogical practices are being used by teachers informal and informal classrooms in developing countries.
- Curriculum, Teacher education.

Unit - II [6 Hours]
- Evidence on the effectiveness of pedagogical practices
- Methodology for the in depth stage: quality assessment of included studies.
- How can teacher education (curriculum and practicum) and the schoolcurriculum and guidance materials best support effective pedagogy?
- Theory of change.
- Strength and nature of the body of evidence for effective pedagogicalpractices.
- Pedagogic theory and pedagogical approaches.
- Teachers' attitudes and beliefs and Pedagogic strategies.

Unit – III [6 Hours]
- Professional development: alignment with classroom practices and followup
- support
- Peer support
- Support from the head teacher and the community.
- Curriculum and assessment
- Barriers to learning: limited resources and large class sizes

Unit – IV [4 Hours]
- **Research gaps and future directions**
- Research design
- Contexts
- Pedagogy
- Teacher education
- Curriculum and assessment
- Dissemination and research impact

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Text Book:

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2):245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.
3. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher educationresearch project (MUSTER) country report 1. London: DFID.
4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning ofbasic maths and reading in Africa: Does teacher preparation count? International Journal
5. Educational Development, 33 (3): 272–282.
6. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education.Oxford and Boston: Blackwell.
7. Chavan M (2003) Read India: A mass scale, rapid, 'learning to read' campaign.
8. www.pratham.org/images/resource%20working%20paper%202.pdf.

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Course Code	CourseName	L	T	P	C	QP
MECAU2053	Stress Management by Yoga	2	0	0	0	A
	SYLLABUS					

Unit – I [8 Hours]
- Definitions of Eight parts of yog. (Ashtanga)
- Yam and Niyam.
- Do`s and Don't's in life.
- Ahinsa, satya, astheya, bramhacharya and aparigraha
- Shaucha, santosh, tapa, swadhyay, ishwarpranidhan

Unit - II [6 Hours]
- Asan and Pranayam
- Various yog poses and their benefits for mind & body
- Regularization of breathing techniques and its effects-Types of
- pranayam

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Book:
1. 'Yogic Asanas for Group Tarining-Part-I" : Janardan Swami Yogabhyasi Mandal, Nagpur
2. "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata

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M.TECH ECE (R-2019)

Course Code	CourseName	L	T	P	C	QP
MECAU2054	**Personality Development through Life Enlightenment Skills**	**2**	**0**	**0**	**0**	A
SYLLABUS						

Unit – I [8 Hours]

Neetisatakam-Holistic development of personality
- Verses- 19,20,21,22 (wisdom)
- Verses- 29,31,32 (pride & heroism)
- Verses- 26,28,63,65 (virtue)
- Verses- 52,53,59 (dont's)
- Verses- 71,73,75,78 (do's)

Unit - II [6 Hours]

Approach to day to day work and duties.
- Shrimad Bhagwad Geeta : Chapter 2-Verses 41, 47,48,
- Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17,
- 23, 35,
- Chapter 18-Verses 45, 46, 48.

Unit – III [8 Hours]

Statements of basic knowledge.
- Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68
- Chapter 12 -Verses 13, 14, 15, 16,17, 18
- Personality of Role model. Shrimad Bhagwad Geeta:
- Chapter2-Verses 17, Chapter 3-Verses 36,37,42,
- Chapter 4-Verses 18, 38,39
- Chapter18 – Verses 37,38,63

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Book:
1. "Srimad Bhagavad Gita" by Swami Swarupananda Advaita Ashram (Publication Department), Kolkata
2. Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P.Gopinath, Rashtriya Sanskrit Sansthanam, New Delhi.

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M.TECH ECE (R-2019)

Course Code	CourseName	L	T	P	C	QP
MECPC2160	**AntennasandRadiatingSystemsLaboratory**	**0**	**0**	**4**	**2**	A
LIST OF EXPERIMENTS							

1. Simulationofhalfwavedipoleantenna.

2.Simulationofchange oftheradiusandlengthofdipolewireonfrequencyofresonance ofantenna.

3. Simulationofquarter wave,fullwaveantennaand comparisonoftheirparameters.

4. Simulationofmonopoleantennawithand withoutgroundplane.

5. Studytheeffectoftheheightofthemonopoleantennaontheradiationcharacteristics oftheantenna.

6. Simulationofahalfwavedipoleantennaarray.

7. Studytheeffectofchangeindistancebetweenelementsofarrayonradiationpatternof dipolearray.

8. Studytheeffectofthevariationofphasedifference'beta'betweentheelementsofthe arrayontheradiationpatternofthedipole array.

9. Casestudy.

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M.TECH ECE (R-2019)

Course Code	CourseName	L	T	P	C	QP
MECPC2170	**Advanced Digital Signal Processing lab**	**0**	**0**	**4**	**2**	A
LIST OF EXPERIMENTS						

1. Basic Signal Representation

2. Correlation Auto And Cross

3. Stability Using Hurwitz Routh Criteria

4. Sampling FFT Of Input Sequence

5. Butterworth Lowpass And Highpass Filter Design

6. Chebychev Type I,II Filter

7. State Space Matrix from Differential Equation

8. Normal Equation Using Levinson Durbin

9. Decimation And Interpolation Using Rationale Factors

10. Maximally Decimated Analysis DFT Filter

11. Cascade Digital IIR Filter Realization

12. Convolution And M Fold Decimation &PSD Estimator

13. Estimation Of PSD

14. Inverse Z Transform

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III SEMESTER

Sl. No	Course type	Course Code	Course Name	L	T	P	C
1	PE	MECPE3011	High-performance Networks	3	0	0	3
		MECPE3012	Pattern Recognition and Machinelearning				
		MECPE3013	Remote Sensing				
2	OE	MECOE3021	Business Analytics	3	0	0	3
		MECOE3022	Industrial Safety				
		MECOE3023	Operations Research				
		MECOE3024	Cost Management of Engineering Projects				
		MECOE3025	Composite Materials				
		MECOE3026	Waste to Energy				
3	Project	MECES3130	Project – I	0	0	20	10
Total				6	0	20	**16**

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M.TECH ECE (R-2019)

Subject Code	Subject Name	L	T	P	C	QP
MECPE3011	**High Performance Networks**	3	0	0	3	A
	SYLLABUS					

Unit 1: [8 Hours]

Types of Networks, Network design issues, Data in support of network design. Network design tools, protocols and architecture. Streaming stored Audio and Video, Best effort service, protocols for real time interactive applications, Beyond best effort, scheduling and policing mechanism, integrated services, and RSVP-differentiated services.

Unit 2: [10 Hours]

VoIP system architecture, protocol hierarchy, Structure of a voice endpoint, Protocols for the transport of voice media over IP networks. Providing IP quality of service for voice, signalling protocols for VoIP, PSTN gateways, VoIP applications.

Unit 3: [4 Hours]

VPN-Remote-Access VPN, site-to-site VPN, Tunneling to PPP, Security in VPN. MPLSoperation, Routing, Tunneling and use of FEC, Traffic Engineering, MPLS based VPN, overlay networks-P2P connections.

Unit 4: [8 Hours]

Traffic Modeling: Little's theorem, Need for modeling, Poisson modeling, Non-poisson models, Network performance evaluation.

Unit 5: [4 Hours]

Network Security and Management: Principles of cryptography, Authentication, integrity, key distribution and certification, Access control and fire walls, attacks and counter measures, security in many layers.

Unit 6: [8 Hours]

Infrastructure for network management, The internet standard management framework – SMI, MIB, SNMP, Security and administration, ASN.1.

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Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert//

Text Book:
- Kershenbaum A., "Telecommunications Network Design Algorithms", Tata McGraw Hill,1993.
- Larry Peterson & Bruce David, "Computer Networks: A System Approach", MorganKaufmann, 2003.
- Douskalis B., "IP Telephony: The Integration of Robust VoIP Services", Pearson Ed. Asia,2000.
- Warland J., Varaiya P., "High-Performance Communication Networks", Morgan Kaufmann, 1996.
- Stallings W., "High-Speed Networks: TCP/IP and ATM Design Principles", Prentice Hall1998.
- Leon Garcia, Widjaja, "Communication networks", TMH 7threprint 2002.
- William Stalling, "Network security, essentials", Pearson education Asia publication, 4thEdition, 2011.

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M.TECH ECE (R-2019)

Subject Code	Subject Name	L	T	P	C	QP
MECPE3012	**Pattern Recognition and Machine Learning**	3	0	0	3	A
	SYLLABUS					

Unit 1:   **[10 Hours]**

Introduction to Pattern Recognition: Problems, applications, design cycle, learning andadaptation, examples, Probability Distributions, Parametric Learning - Maximum likelihood and Bayesian Decision Theory- Bayes rule, discriminant functions, loss functions and Bayesian error analysis

Unit 2:   **[8 Hours]**

Linear models: Linear Models for Regression, linear regression, logistic regression LinearModels for Classification

Unit 3:   **[6 Hours]**

Neural Network: perceptron, multi-layer perceptron, backpropagation algorithm, error surfaces,practical techniques for improving backpropagation, additional networks and training methods, Adaboost, Deep Learning

Unit 4:   **[4 Hours]**

Linear discriminant functions - decision surfaces, two-category, multi-category, minimum-squared error procedures, the Ho-Kashyap procedures, linear programming algorithms, Support vector machine

Unit 5:   **[6 Hours]**

Algorithm independent machine learning – lack of inherent superiority of any classifier, biasand variance, re-sampling for classifier design, combining classifiers

Unit 6:   **[8 Hours]**

Unsupervised learning and clustering – k-means clustering, fuzzy k-means clustering,hierarchical clustering

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert//

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Text Book:
- Richard O. Duda, Peter E. Hart, David G. Stork, "Pattern Classification", 2nd Edition John Wiley & Sons, 2001.

- Trevor Hastie, Robert Tibshirani, Jerome H. Friedman, "The Elements of Statistical Learning", 2nd Edition, Springer, 2009.

- C. Bishop, "Pattern Recognition and Machine Learning", Springer, 2006

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M.TECH ECE (R-2019)

Subject Code	Subject Name	L	T	P	C	QP
MECPE3013	**Remote Sensing**	3	0	0	3	A
	SYLLABUS					

Unit 1: [10 Hours]

Physics Of Remote Sensing: Electro Magnetic Spectrum, Physics of Remote Sensing-Effects of Atmosphere-Scattering–Different types–Absorption-Atmospheric window-Energy interaction with surface features –Spectral reflectance of vegetation, soil and water atmospheric influence on spectral response patterns-multi concept in Remote sensing.

Unit 2: [8 Hours]

Data Acquisition: Types of Platforms–different types of aircrafts-Manned and Unmannedspacecrafts–sun synchronous and geo synchronous satellites –Types and characteristics of different platforms –LANDSAT,SPOT,IRS,INSAT,IKONOS,QUICKBIRD etc

Unit 3: [6 Hours]

Photographic products, B/W, color, color IR film and their characteristics –resolvingpower of lens and film -Opto mechanical electro optical sensors –across track and along track scanners-multispectral scanners and thermal scanners–geometric characteristics of scanner imagery -calibration of thermal scanners.

Unit 4: [8 Hours]

Scattering System: Microwave scatterometry, types of RADAR –SLAR –resolution –range and azimuth –real aperture and synthetic aperture RADAR. Characteristics of Microwave images topographic effect-different types of Remote Sensing platforms –airborne and space borne sensors -ERS, JERS, RADARSAT, RISAT -Scatterometer, Altimeter-LiDAR remote sensing, principles, applications.

Unit 5: [10 Hours]

Thermal And Hyper Spectral Remote Sensing: Sensors characteristics-principle ofspectroscopy-imaging spectroscopy–field conditions, compound spectral curve, Spectral library, radiative models, processing procedures, derivative spectrometry, thermal remote sensing – thermal sensors, principles, thermal data processing, applications.

Unit 6: [4 Hours]

Data Analysis: Resolution–Spatial, Spectral, Radiometric and temporal resolution-signalto

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noise ratio-data products and their characteristics-visual and digital interpretation–Basic principles of data processing –Radiometric correction–Image enhancement–Image classification– Principles of LiDAR, Aerial Laser Terrain Mapping.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert//

Text Book:
- Lillesand T.M., and Kiefer,R.W. Remote Sensing and Image interpretation, John Wiley & Sons-2000, 6thEdition

- John R. Jensen, Introductory Digital Image Processing: A Remote Sensing Perspective, 2nd Edition, 1995.

- John A.Richards, Springer –Verlag, Remote Sensing Digital Image Analysis,1999.

- Paul Curran P.J. Principles of Remote Sensing, ELBS; 1995.

- Charles Elachi and Jakob J. van Zyl , Introduction To The Physics and Techniques of Remote Sensing , Wiley Series in Remote Sensing and Image Processing, 2006.

- Sabins, F.F.Jr, Remote Sensing Principles and Image interpretation, W.H.Freeman& Co, 1978

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M.TECH ECE (R-2019)

Subject Code	Subject Name	L	T	P	C	QP
MECOE3021	**Business Analytics**	3	0	0	3	A
	SYLLABUS					

Unit 1: [10 Hours]

Business analytics: Overview of Business analytics, Scope of Businessanalytics,BusinessAnalyticsProcess,Relationship of Business Analytics Process and organisation, competitive advantagesofBusinessAnalytics. Statistical Tools: Statistical Notation, Descriptive Statistical methods, Review ofprobabilitydistributionand data modelling, samplingand estimationmethodsoverview.

Unit 2: [8 Hours]

Trendiness and Regression Analysis: Modelling Relationships and Trends in Data, simple Linear Regression. Important Resources, Business Analytics Personnel, Data and models for Business analytics, problem solving, Visualizing and Exploring Data, Business Analytics Technology.

Unit 3: [6 Hours]

Organization Structures of Business analytics, Team management, Management Issues, Designing Information Policy, Outsourcing, Ensuring Data Quality, Measuring contribution of Business analytics, Managing Changes. Descriptive Analytics, predictive analytics, predicative Modelling,

Predictive analytics analysis, Data Mining, Data Mining Methodologies, Prescriptive analytics and its step in the business analytics Process, Prescriptive Modelling, nonlinear Optimization.

Unit 4: [6 Hours]

Forecasting Techniques: Qualitative and Judgmental Forecasting, Statistical Forecasting Models, Forecasting Models for Stationary Time Series, Forecasting Models for Time Series with a Linear Trend, Forecasting Time Series with Seasonality, Regression Forecasting with Casual Variables, Selecting Appropriate Forecasting Models.

Monte Carlo Simulation and Risk Analysis: Monte Carle Simulation Using Analytic Solver Platform, New-Product Development Model, Newsvendor Model, Overbooking Model, Cash Budget Model.

Unit 5: [4 Hours]

Decision Analysis: Formulating Decision Problems, Decision Strategies with the without Outcome

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Probabilities, Decision Trees, The Value of Information, Utility and Decision Making.

Unit6: [6 Hours]

Recent Trends in : Embedded and collaborative business intelligence, Visual data recovery, Data Storytelling and Data journalism.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert//

Text Book:
- BusinessanalyticsPrinciples,Concepts,andApplicationsbyMarcJ.Schniederjans,DaraG. Schniederjans, Christopher M.Starkey,PearsonFTPress.
- Business Analytics by James Evans, persons Education.

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Subject Code	Subject Name	L	T	P	C	QP
MECOE3022	**Industrial Safety**	3	0	0	3	A
SYLLABUS						

Unit-I: [10 Hours]

Industrial safety:Accident,causes,types,resultsandcontrol,mechanicalandelectrical hazards,types,causesandpreventivesteps/procedure,describesalientpointsoffactoriesact1948 forhealth andsafety,washrooms,drinkingwaterlayouts,light,cleanliness,fire,guarding,pressure vessels,etc,Safetycolorcodes.Firepreventionand firefighting,equipmentandmethods.

Unit-II: [6 Hours]

Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.

Unit-III: [8 Hours]

Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.

Unit-IV: [10 Hours]

Fault tracing: Fault tracing-concept and importance, decision treeconcept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic,automotive, thermal and electrical equipment's like, I. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.

Unit-V: [6 Hours]

Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electricalmotor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical

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and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert//

Text Book:
- Maintenance Engineering Handbook, Higgins & Morrow, Da Information Services.

- Maintenance Engineering, H. P. Garg, S. Chand and Company.

- Pump-hydraulic Compressors, Audels, Mcgrew Hill Publication.

- Foundation Engineering Handbook, Winterkorn, Hans, Chapman & Hall London

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Subject Code	Subject Name	L	T	P	C	QP
MECOE3023	**OperationsResearch**	3	0	0	3	A
	SYLLABUS					

Unit 1: [10 Hours]

OptimizationTechniques, ModelFormulation,models,GeneralL.R Formulation, Simplex Techniques,SensitivityAnalysis,InventoryControlModels

Unit2 : [6 Hours]

FormulationofaLPP -Graphicalsolutionrevised simplexmethod-dualitytheory–dual simplexmethod-sensitivityanalysis-parametricprogramming

Unit3: [8 Hours]

Nonlinear programmingproblem-Kuhn-Tucker conditions mincostflow problem-max flowproblem-CPM/PERT

Unit 4: [10 Hours]

Schedulingand sequencing- single serverandmultiple servermodels–deterministic inventorymodels-Probabilisticinventorycontrolmodels-Geometric Programming.

Unit5: [4 Hours]

Competitive Models,Singleand Multi-channelProblems,Sequencing Models,Dynamic Programming,FlowinNetworks,ElementaryGraphTheory, Game TheorySimulation

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert//

Text Book:
- H.A. Taha, Operations Research, An Introduction, PHI, 2008
- H.M. Wagner, Principles of Operations Research, PHI, Delhi, 1982.
- J.C. Pant, Introduction to Optimisation: Operations Research, Jain Brothers, Delhi, 2008
- Hitler Libermann Operations Research: McGraw Hill Pub. 2009
- Pannerselvam, Operations Research: Prentice Hall of India 2010

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Course Code	CourseName	L	T	P	C	QP
MECOE3024	**COST MANAGEMENT OF ENGINEERING PROJECTS**	**3**	**0**	**0**	**3**	A

SYLLABUS

Unit – I [12 Hours]
- Introduction and Overview of the Strategic Cost Management Process Cost concepts in decision-making; Relevant cost, Differential cost, Incremental cost and Opportunitycost.
- Objectives of a Costing System; Inventory valuation; Creation of a Database for operational control; Provision of data for Decision-Making

Unit - II [6 Hours]
- Project: meaning, Different types, why to manage, cost overruns centres, various stages of project execution: conception to commissioning. Project execution as conglomeration of technical and nontechnical activities. Detailed Engineering activities. Pre project execution main clearances and documents Project team: Role of each member. Importance Project site: Data required with significance. Project contracts. Types and contents. Project execution Project cost control. Bar charts and Network diagram. Project commissioning: mechanical and process

Unit – III [10 Hours]
- Cost Behavior and Profit Planning Marginal Costing; Distinction between Marginal Costing and Absorption Costing; Break-even Analysis, Cost-Volume-Profit Analysis. Various decision-making problems. Standard Costing and Variance Analysis. Pricing strategies: Pareto Analysis. Target costing, Life Cycle Costing. Costing of service sector. Just-in-time approach, Material Requirement Planning, Enterprise Resource Planning, Total Quality Management and Theory of constraints. Activity-Based Cost Management, Bench Marking; Balanced Score Card and Value-Chain Analysis. Budgetary Control; Flexible Budgets; Performance budgets; Zero-based budgets. Measurement of Divisional profitability pricing decisions including transfer pricing.

Unit – IV [8 Hours]
- Quantitative techniques for cost management, Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Simulation, Learning Curve Theory.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Book:
1. Cost Accounting A Managerial Emphasis, Prentice Hall of India, New Delhi
2. Charles T. Horngren and George Foster, Advanced Management Accounting
3. Robert S Kaplan Anthony A. Alkinson, Management & Cost Accounting
4. Ashish K. Bhattacharya, Principles & Practices of Cost Accounting A. H. Wheeler publisher
5. N.D. Vohra, Quantitative Techniques in Management, Tata McGraw Hill Book Co. Ltd.

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IV SEMESTER

Sl. No	Course type	Course Code	Course Name	L	T	P	C
1	Project	MECES4110	Project Phase – II	--	--	32	16
			Total	--	--	32	**16**