Bansilal Ramnath Agarwal Charitable Trust's

Vishwakarma Institute of Technology

(An Autonomous Institute affiliated to Savitribai Phule Pune University)

Structure & Syllabus of

B. Tech. (Information Technology)

Effective from Academic Year 2020-21

Prepared by: - Board of Studies in Information Technology

Approved by: - Academic Board, Vishwakarma Institute of Technology, Pune

Signed by

Chairman – BOS **Chairman – Academic Board**

B.Tech. Information Technology Structure (applicable w.e.f. AY 20-21)

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Institute Vision

"To be globally acclaimed Institute in Technical Education and Research for holistic Socio-economic development".

Institute Mission

- To ensure that 100% students are employable and employed in Industry, Higher Studies, become Entrepreneurs, Civil / Defense Services / Govt. Jobs and other areas like Sports and Theatre.
- To strengthen Academic Practices in terms of Curriculum, Pedagogy, Assessment and Faculty Competence.
- Promote Research Culture among Students and Faculty through Projects and Consultancy.
- To make students Socially Responsible Citizen.

Department Vision

"To provide student-centered state-of-the-art academically enriched environment for productive careers in the world of computing through creativity and innovation"

Department Mission

- To promote aspiring ethically conscious engineers demonstrating sustainable employability and entrepreneurship.
- To impart quality education with the focus on analytical and problem-solving skill development.
- To foster inspired scholarly environment through active student-faculty participation in research and development resulting in new knowledge-base or insights.
- To prepare students to shoulder social responsibilities by application of their skill set for betterment of society.

Program Education Objectives (PEO)

PEO	PEO Focus	PEO Statement
PEO1	Preparation	To prepare the students with a commitment towards meeting the needs of users within an organizational and societal context through the selection, creation, application, integration and administration of Information Technology projects.
PEO2	Core competence	To facilitate students with foundation of mathematical & engineering fundamentals along with knowledge of Information Technology principles and applications and be able to integrate this knowledge in a variety of business and inter-disciplinary setting.
PEO3	Breadth	To enable student to exercise problem solving capacity with effective use of analysis, design, development that address idea realization.
PEO4	Professionalism	To inculcate students with professional and ethical values with effective skills leading to participative teamwork having multidisciplinary knowledge useful to the society.
PEO5	Learning Environment	To provide students an academic environment that develops leadership qualities, excellence in subject areas of Information Technology and lifelong learning in every sphere of their life.

List of Programme Outcomes [PO]

Graduates will be able

PO	PO Statement
PO1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
PSO	**PSO Statement**
PSO1	Apply information science theory, algorithmic and programming principles for comprehending technological trade-off in order to determine conceptual aspects of real-world problems in information technology.
PSO2	Analyze and create problem frames in order to formulate decomposition structure of information technology problem with correct resources, infrastructure and technology requirements determination for solution realization.
PSO3	Compose technical design specifications using template-based approaches for formally expressing the solution implementation by applying techniques and methods to create, enhance, and deliver IT tools with appropriate CASE tools selection.

PSO4	Exercise research and development aptitude focusing knowledge creation and dissemination through engineering artifacts construction, preparation and presentation of engineering evidences using procedures, techniques, guidelines, and standards considering technology migration and evolution.

B.Tech. Information Technology Structure (applicable w.e.f. AY 20-21)

SY IT Module -III(B20 Pattern)

Subject head	Course code	Course name	Contact hours per week			Credits
			Theory	Lab	Tut	
S1	MD2201	Data Science	3	2	1	5
S2	MD2202	Applied Electronics	3	2	1	5
S3	MD2203	Mechanical and System Engineering	3	2	1	5
S4	CS2218	Object Oriented Programming	3	2	1	5
S6	IT2263	Software Development Project – I	-	-	-	3
S7	IT2264	Engineering Design and Innovation – III	-	-	-	4
		Total	**12**	**08**	**4**	**27**

B.Tech. Information Technology Structure (applicable w.e.f. AY 20-21)

SY IT Module –IV (B20 Pattern)

Subject head	Course code	Course name	Contact hours per week			Credits
			Theory	Lab	Tut	
S1	IT2250	Data Structures	3	2	1	5
S2	IT2251	Computer Architecture And Operating System	3	2	1	5
S3	IT2252	Data Communication and Networking	3	2	1	5

S4	IT2255	Engineering Design	-	2	-	1
S5	IT2256	Software Design	-	2	-	1
S6	IT2253	Software Development Project – I	-	-	-	3
S7	IT2254	Engineering Design and Innovation – III	-	-	-	4
S8		**Total**	**9**	**10**	**3**	**24**

FFNo.: 654

COURSECODE:MD2201 COURSENAME:DATASCIENCE

CoursePrerequisites:

1. LinearAlgebraBasics
2. CentralTendency&Measures ofDispersion– Mean,Mode, Median
3. Probability
4. Someexposuretoprogrammingenvironment–Cprogramming;Python

CourseObjectives:

1. Understanddataprocessingpipeline
2. Performdimensionalityreductionoperations
3. Optimizetheperformanceoffunctions
4. Applydescriptivestatistics tools
5. Deducemeaningfulstatisticalinferences
6. Useunsupervisedclassificationalgorithms
7. Usesupervisedclassificationalgorithms
8. Utilizethedata scienceprinciplesforanentireproject lifecycleas a casestudy

Credits:5 **TeachingSchemeTheory:3**Hours/Week

Tut:1 Hours/Week

Lab:**2**Hours/Week

CourseRelevance:

ThecourseisofferedinS.Y.B.Tech.toallbranchesofEngineering

DataScienceisamultidisciplinaryfield.Itusesscientificapproaches,procedures,algorithmsandframework sto extract knowledgeand insightfrom a hugeamount of data.

Data Science uses concepts and methods which belong to fields like information technology,Mathematics,Statistics, ComputerScienceetc.

Data Science influences the growth and improvements of the product by providing a lot ofintelligence about customers and operations, by using methods such as data mining and dataanalysis.

The course is relevant to all branches of Engineering and beyond, since data is generated as anobviousoutcomeof manyprocesses.

SECTION-1

- IntroductiontoDataScience

Roleofdatascientist,introductiontoR,Rstudio;introductiontounivariateandmultivariate systems, understanding databases, Data Processing - Data collection; Datapreparation ; Data visualization techniques and inferences - scatter plot, scatter matrix,histogram,boxplot. **(6Hours)**

- Normal distribution, evaluating normal distribution, Binomial distribution, confidenceIntervals, central limit Theorem, hypothesis testing, inference for numerical data – t-distribution,paireddata, ANOVA **(8Hours)**
- Vector norms, distances & projections, discriminants, least squares, Singular ValueDecomposition,PrincipalComponentAnalysis,Optimization:constrainedandunconstrained, Gradient Descent **(6 Hours)**

SECTION-2

- Supervised Learning – line fitting, residuals, correlation; line fitting by least squaresregression;outliersinlinearregression;Inferenceforlinearregression;Multipleregression;Modelselection;Logisticregression,NearestNeighborClassification–Knn;Naïve Bayes Classification – Bayesian methods, Bayes algorithm; Classification usingdecisiontreesandlearners **(9Hours)**
- Unsupervised Clustering - K-means clustering; Evaluation of model performance – Confusionmatrices,sensitivity,specificity,kappastatistics,precision,recall,F-measure,ROC curve etc.; Methods of cross-validation, Bootstrapping; Meta-learning throughensembleapproach– Bagging,boosting,Random Forestsstrategies. **(7Hours)**
- ApplicationsofDataScience–Indicative List: **(4Hours)**
    - PredictingdefaultcasesintheBankingIndustry;
    - Predictpassengers'survivalinaShipmishapevaluationtechnique;
    - ClassifyJunk emailsbased onprobability;
    - Classifymalicious websites;
    - SMSSpamcollectiondata:
    - Gender recognition byvoice;
    - StoreItemDemandForecasting:
    - Predict3monthsofitemsalesatdifferentstore

Listof Tutorials:

1. DataVisualization
2. DistancesandProjections
3. SingularValueDecomposition
4. PrincipalComponentAnalysis
5. Optimization
6. Normal&BinomialDistribution
7. HypothesisTesting
8. ANOVAtest
9. LinearRegression
10. LogisticRegression
11. NearestNeighborClassification
12. DecisionTreesbased classification
13. NaiveBayes classification
14. Clustering
15. Evaluationofmodelperformance
16. Bagging&Boostingapproaches

ListofPracticals: (AnySix)

1. Datavisualization
2. UnconstrainedOptimization
3. HypothesisTesting
4. Linearregression
5. LogisticRegression
6. NearestNeighborclassification
7. NaiveBayes classification
8. Clustering
9. ClassifierperformanceusingConfusion matrixandotherattributes
10. CrossValidationmethods

Listof CourseProjects:

1. Movierecommendationsystem
2. CustomerSegmentation usingMachineLearning
3. Sentimentanalysis
4. UberDataanalysis
5. Loanprediction
6. HVACneedsforecasting
7. Customerrelationshipmanagement
8. Clinicaldecisionsupportsystems
9. Developmentofmachinelearningsolutionsusingavailabledatasets(multipleprojects)
10. Frauddetection

Listof CourseSeminar Topics:

1. Datawrangling
2. Predictivemodeling
3. Dataanalyticsinlifescience(multipletopics)
4. Ensemblemodelingtechniques
5. Textpre-processing
6. Featurescalingformachinelearning
7. Multivariatenormaldistributionapplications
8. Distancemetrics andtheirapplications
9. VisualizationtechniquessuchasChernoff'sfaces
10. Treebasedalgorithms
11. Ridgeregression
12. LASSO

Listof CourseGroupDiscussionTopics:

1. PCAand ICA
2. Hierarchicalandnonhierarchicalsystems
3. Linear-Non linearregression
4. Parametric-nonparametricestimation
5. Overfittingandunderfittinginthecontextof classification
6. Linearand Quadraticdiscriminantanalysis
7. Regressionv/sclassification
8. Classifierperformancemeasures
9. Supervisedandunsupervisedlearning
10. Variousclusteringapproaches
11. Classifiersandclassifier combinations
12. Balancingerrorsinhypothesistesting
13. Standardsamplingpractices forasuccessful surveyforreliable sampledata

Listof HomeAssignments:

CaseStudy: Averylargenumberofresourcesareavailablefordatageneratedoutofcasestudy.Unique Homeassignments will be set up forall groups
Surveys: Principlesofsurveyingwillbeimplementedbygroupstodemonstrateuseofdatascienceprinciples in home assignments

AssessmentScheme:

MidSemesterExamination-
10MarksPresentation-15 Marks
Laboratory-10MarksCourse
Project - 10 MarksHome
Assignment - 10
MarksGroupDiscussion-
15Marks

End Semester Examination - 10
MarksComprehensiveVivaVoce -20
Marks

TextBooks:*(AsperIEEE format)*

1. 'ABeginner'sGuideto R' –Zuur,Leno,Meesters;Springer,2009
2. 'IntroductiontoDataScience'–Igual,Segui;Springer,2017
3. 'MathematicsforMachineLearning'– Diesenroth,Faisal,Ong;CambridgeUniversityPress,2017
4. 'MachineLearningwith R'– Lantz,PacktPublishing,2018

ReferenceBooks:*(AsperIEEE format)*

1. 'ElementsofStatistical Learning'-Hastie,Tibshirani,Friedman;Springer;2011
2. 'DataSciencefromScratch'-Grus;GoogleBooks;2015
3. 'TheartofDataScience'-Matsui,Peng;2016
4. 'Machine Learningforabsolutebeginners' -Theobald;GoogleBooks;2017

MoocsLinksandadditionalreadingmaterial:www.nptelvideos.in

1. https://www.edx.org/course/machine-learning-fundamentals-2
2. https://www.edx.org/course/foundations-of-data-analysis-part-1-statistics-usi
3. https://www.coursera.org/learn/statistical-inference/home/welcome
4. https://www.coursera.org/learn/data-scientists-tools/home/welcome

CourseOutcomes:

Uponcompletionofthecourse, studentwill beableto–

1. ApplyData processing& datavisualization techniques-3
2. Implementdimensionalityreduction&optimizationtechniquesforenhancingdatasuitability-5
3. PerformDescriptiveandInferentialstatisticalanalysisforbuildingreliablepredictions -4
4. ImplementSupervisedalgorithmsforclassificationandprediction-4
5. ImplementUnsupervisedclassificationalgorithms-3
6. Evaluatetheperformancemetricsofsupervisedandunsupervisedalgorithms-2
7. DemonstratecompleteDataSciencelifecyclewithcasestudies-4

CO PO Map:

	Program Outcomes												Program Specific Outcomes			
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO13	PSO14	PSO15	PSO16
CO1	3	2	2										2	1		2
CO2	2	3	2										3	2	2	2
CO3	3	3	3										2		2	2
CO4	2	2	3										1	1		2
CO5	2	3	3										1	1		2
CO6	2	3	2										1	1		2

FutureCoursesMapping:

1. DeepLearning
2. ReinforcementLearning
3. DBMS
4. BigData
5. DataMining
6. InformationRetrieval
7. RecommendationSystems
8. CloudComputing–AWS
9. IOT
10. ArtificialIntelligence
11. PatternRecognition
12. NaturalLanguageProcessing
13. ComputerVision
14. MachineVision

15. FaultDiagnosis
16. Optimization
17. Bioinformatics
18. ComputationalBiology
19. Econometrics
20. SupplyChain
21. Ergonomics
22. OperationsResearch
23. Nano-informatics

JobMapping:
Jobopportunitiesthatonecan getafterlearningthiscourse

1. DataScientist
2. DataAnalyst
3. AIEngineer
4. DataArchitect.
5. DataEngineer.
6. Statistician.
7. DatabaseAdministrator.
8. BusinessAnalyst
9. Business IntelligenceDeveloper
10. InfrastructureArchitect
11. EnterpriseArchitect
12. MachineLearningEngineering
13. Machine LearningScientist

FFNo.: 654

COURSECODE:MD2202 COURSENAME:APPLIEDELECTRONICS

CoursePrerequisites:

Conceptsofmodernphysics

CourseObjectives:

1. Tofamiliarizewithworkingandapplicationsofelectronicdevicesandcircuits
2. Tointroducevarioussignals,systemsanditsanalysis
3. Tounderstandconceptsoffeedbackcontrolsystemanditsperformanceanalysis
4. Todesignbasicdigital circuitsandunderstandtheirapplications
5. Toknowbasicsofpower devices,componentsandtheirapplications
6. Tocomprehend fundamentalsofcommunicationsystem

Credits:5 **TeachingSchemeTheory:3**Hours/Week

Tut:1 Hours/Week

Lab:**2**Hours/Week

CourseRelevance:

Now-a-days,therearelotsofelectronicandelectro-mechanicalsystemswithembeddedelectronics for their control. A knowledge of fundamentals of electronics and major functioningof electronic devices and systems can assist an engineer to better communicate and collaborateforthe design / manufacturingof various systems**.**

SECTION-1
Topicsand Contents ● **Devices& Circuits** **(8Hours)** RoleofAppliedElectronics,BasicElectronicComponents,RLCCircuits,DiodeApplications,Transistorasan Amplifier,Operational AmplifierCircuits. ● **Signals&Systems** **(7 Hours)** Signals,Systems,ImpulseResponse&Convolution,SignalOperations,BasicImageProcessingTechniques,Transforms. ● **ControlSystems** **(6Hours)** SignalFlowGraphs,Blockdiagramreduction,SystemStability,BodePlots,NetworkTheorems,Single&TwoPort Networks.

SECTION-2

Topicsand Contents

- **DigitalElectronics (6 Hours)**

BooleanAlgebra,CombinationalLogicCircuits,SequentialLogicCircuits,Converters

- **PowerElectronics (5 Hours)**

PowerDevices,PowerCircuits,PowerSupply,SMPS,UPS,Batteries

- **Communication (8Hours)**

CommunicationSystem,AnalogCommunication,DigitalCommunication,WirelessCommunicationBasics,CommunicationProtocols,MobileCommunication

ListofPracticals: (AnySix)

1. IdentificationofElectronicscomponents&Devices
2. Studyof SeriesResonance&Parallel Resonance Circuit
3. Diodeasclipper &clamper
4. CommonEmitterAmplifier
5. OPAMPInverting&Non-InvertingAmplifier-Selfstudy
6. GenerationofSignals&SignalOperations
7. ImplementationofAnalogFilter
8. ImplementationofImagePre-processingTechniques
9. Design andevaluationof secondordersystem
10. Designlead/lagcompensatingnetworkforthegivenspecifications
11. Understandthefunctioningoflogicgates,theirimplementationandverificationoftruthtables.
12. Designofcodeconverter
13. Design andimplementa Combinationallogiccircuitforgivenbooleanequation
14. Designand implementMod-n CounterusingJ-K flip flops
15. Design andimplementSequence generatorusingshiftregister
16. CombinationallogicdesignusingMultiplexers
17. Gate Firing Circuits for SCR's: To trigger an SCR by using R, RC & UJT triggeringcircuitsand observethe outputwaveforms for different firingangles.
18. To construct a single-phase half-controlled bridge rectifier and to observe the outputwaveformswith a.R load, b.RLLoad,c.RLCLoad, usingMATLAB
19. BuildDoublesidebandsuppressedcarrier(DSBSC)modulatoranddemodulator.Observespectralcomponentsoftime-domainsignalusingDigitalStorageOscilloscope(DSO).
20. BuildFrequencymodulator(FM).
21. SimulationofAnalogcommunicationsystem.
22. SimulationofDigitalcommunicationsystem.

Listof CourseProjects:

1. Designand implement230V ACBulb On-Offswitch usingBJT&Relay
2. Design andImplementOR&ANDlogic circuitsusingP-Ndiodes.
3. Design and ImplementNAND&NORgateusingTransistor
4. DesignBandPassFilterusingRLCcircuit
5. Design andimplementLowPassFilterusingOPAMP
6. FunctionGenerator
7. ImageEnhancer
8. AutomatedInspectionSystem(IPBased)
9. NoiseRemovalSystem
10. SpectrumAnalyser
11. SmartLiftControlSystem
12. Onofftemperaturecontroller
13. AlcoholSensingDisplayWith Alarm Project
14. TemperaturecontrolinRoom
15. SmartTrafficControlSystem
16. SeasonBasedAutomaticStreet LightsSwitching
17. DisplayObject Counter On 7 Segment Display
18. HomeAutomationUsingTouchScreen
19. MotionBasedAutomatic DoorOpener
20. Solarlightingsystem withautotracking
21. DesignStaircaselightingusingflipflops
22. Designbatterylevelindicator
23. Design4biterror checker/generatorcircuit
24. Designparitygenerator for3 bitsinput.
25. Design DigitaltoAnalogConvertercircuitusingDAC0808
26. DigitalICtester
27. BatteryChargerusingControlled Rectifier
28. PreciseIlluminationControlofLampusingThyristors(Intensitycontroloflighting)
29. Developaswitching/triggeringcircuitforapowerdevice(SCR/powerBJT/powerMOSFET /IGBT)
30. FanRegulator–SpeedControlandRotationDirectionControl
31. SolarLamp
32. HomeautomationsystemusingPacketTracer
33. SimulationofAnalog/DigitalCommunicationSystem
34. Pre-emphasisandDe-emphasisforFM
35. DesignofAntialiasingfilter
36. DesignofAudioSystem
37. ImplementationofAdaptiveDeltamodulatortoavoidslopeoverload distortion
38. GenerationofdiscretePAMsignal

Listof CourseSeminar Topics:

1. Roleofimpuritiesin formationof P&Ntypeof Material
2. Zenerdiodeasvoltageregulator andavalanchebreakdown
3. CLASSA,CLASS B,CLASSC&CLASSDtypesofamplifiers
4. RoleofQfactor inseriesresonanceandparallelresonance
5. Optoelectronicdevices
6. DifferentElectronics DevicesUsedinIndustries
7. PCBdesigncriteriaforRFapplications
8. DifferenttypesofHeatsinksforPowersemiconductordevices
9. DifferenttypesofPCBconnectors
10. LiquidCrystalDisplayDevice
11. TypesofPCB&PCBDesignRules
12. LiDAR Technology
13. OLEDTechnology
14. Surveillance-cameraSystem
15. RFIDTechnology
16. CompressedImageProcessing
17. WirelessPowerTransmissionTechnology
18. LaplaceTransform
19. FourierSeries
20. FourierTransform
21. ImportantAttributesofanImage
22. Workingof AutomaticwashingMachine
23. SystemofBreadToaster
24. RecentstandardsusedinControlSystem Industry
25. HowInfrared ThermalGunworks?
26. Workingof AutomaticTea/coffeevendingmachine
27. PLCBasedProductSortingMachine
28. Useof Electronicsin Automobileindustry
29. UseofElectronicsinChemical Industries
30. HydraulicControlSystems
31. FuzzyControllers
32. DistributedControlSystems
33. DataAcquisitionSystem
34. PneumaticControlSystemComponents
35. E-P&P-Econverters
36. DigitalLogicFamilies
37. DigitalCircuitDesignusingPLA &PAL
38. Differentanalogto digital(ADC) conversiontechniques
39. Differentdigitaltoanalog(DAC)conversiontechniques
40. RoleofMemoryDevicesinEmbedded Systems
41. Algorithmicstatemachinesandsequentiallogiccircuits
42. Switchcapacitor

43. Hazardsindigitalcircuits
44. Alphanumericcodes
45. FieldProgrammableGateArrays(FPGA)
46. DigitalintegratedcircuitsCharacteristics:Logiclevels,propagationdelay,powerdissipation,fan-out and fan-in, noisemargins
47. AdvancesinAnalog-to-DigitalConvertersoverthe Last Decade
48. HybridElectricVehicles
49. ApplicationsofPowerDiodes
50. RoleofPower ElectronicsinRenewable EnergyDeployment
51. Insulated-gatebipolartransistor(IGBT)
52. Role ofPower Electronics Technologyto EnergyEfficiencyand CO2 Reduction
53. Industrial Laserpowersupply
54. TractioncontrolofElectricVehicles
55. ElectricBikes
56. Subwayandlocomotivepropulsion
57. Powercontrolofweldingarcfurnace
58. Hownewtechnologiesareaffectinghealth (Physicalandmental)
59. variousWirelesstechnologiesthatcould make5Gfaster
60. EffectofMobilephonesonhealth
61. Harnessingtechnologyforbettermentalhealthservices
62. Cognitiveradio
63. Softwaredefinedradio
64. ApplicationsofRadarindefense
65. Workingof Jiofibre
66. BluetoothApplications
67. MANETsandVANETs

Listof CourseGroupDiscussionTopics:

1. RoleofSurfacemounttechnologyin Electronic circuits
2. TypesofDiodesandtheirapplications
3. RoleofMOSFET intheelectronicsswitchingcircuits
4. CharacteristicsofidealOPAMP
5. 555Timer IC anditsapplications
6. CanPCBbeconsideredas agraph(DataStructures)?
7. DisplayTechnology
8. PhotoSensingDevices
9. SolidstaterelayVsElectromechanicalrelay
10. Roleofelectronicsinmechanical&Allied industries
11. NextGenerationPhotoVoltaics
12. NextGenerationMOSFETS(e-GaNMOSFET)
13. ConvolutioninImageProcessing
14. 5GCommunication -SystemPerspective
15. SignificanceofImpulseResponse
16. FourierSeriesvsFourierTransform
17. ApplicationsofLaplaceTransform
18. ConvolutionIntegral
19. ImpulseResponsevs StepResponse
20. Significanceof LTISystem
21. CausalityofLTISystem
22. LinearSystemvsNon-linearSystem
23. AnalogSystemvsDigitalSystem
24. Stabilitycriterion for Control Systems
25. Processcontroller
26. Openloopandclosedloopsystems
27. ApplicationsofElectronicsinBoilers
28. Sensorsusedin Automobileindustries
29. Modellingamechanicalsystemforsystemanalysis
30. ModellingaElectricalsystem forsystemanalysis
31. ApplicationsofBodeplotinSystem Stability
32. IntelligentController
33. Automationinproductionindustries
34. Roleofdigitalelectronicsinthefieldofconsumer electronics
35. Roleofdigital electronicsinthefieldofCommunication
36. ImportanceofMilitarygradeintegratedcircuits
37. Edgetriggered &leveltriggereddigitalcircuits
38. Applicationsofdigitalelectronicsinmechanicalsystems
39. WhatisDigitalinDigital Electronics?
40. Whatis Analogin AnalogElectronics?
41. Howdoes digital technologyimproveour lives ?
42. Digitization:Pros &Cons

43. Journeyoftelevisionfrom CRTtoLED
44. ApplicationSpecificIntegratedCircuits(ASICs)
45. HistoryofMicroprocessor
46. EnergyStorageTechnologies/Techniques
47. LinearRegulatedPower SupplyandSMPS
48. ProsandConsofPower ElectronicsConverters
49. SmartElectricGrid
50. MotorDrives-TypesandApplications
51. RoleofPowerElectronics inClimateChange
52. MaterialsusedinPower Electronics forimprovedperformance andefficiency
53. Powerelectronicsinbiomedicalfield
54. MiniaturizationofPowerelectronicsdevices-Challenges
55. RoleofCircuitBreakers-TypesandApplications
56. DigitalRevolutionincommunicationsystems-ProsandCons
57. Effectsofnoiseanddistortiononanalog anddigitalsignal
58. Effectofsampling rate,bitrate onaudioquality
59. UseofSatellitesinDisasterManagementinIndia
60. SubmarineCommunicationforGlobal InternetConnectivity
61. InternetofThings
62. Wi-Fi--Securityand Privacy
63. WirelessSensorNetworks
64. WirelessConnectivity- Anytimeanywhere
65. ConnectedCars

Listof HomeAssignments:

Design

1. Design Voltagemultipliercircuitusingdiodesand capacitors
2. Designoftransistorizedregulatedpowersupply
3. DesignofRLC Impedancematchingcircuit
4. DesignofAstablemultivibratorusingOPAMP
5. DesignofAudioAmplifier
6. SatelliteForAmateurRadio
7. FaceDetectionSystem
8. DetectionofBreathing
9. PitchRecognitionSystem
10. DenoisingAudioSignal
11. DesignPID controller forFlowControlloop
12. DesignPIcontrollerforLevelControl loop
13. DesignPID controller forTemperatureControlloop
14. DesignPID controllerforDCmotorspeedcontrol
15. DesignTokenNumberDisplaySystem

16. DesignTalkingTokenNumberDisplaySystemusingCMOSkeyencoderandsevensegment displayand Speech encoder
17. Design waterlevelcontrollerusinglogic gates&relays.
18. DesignLEDchaser
19. Design DigitalVoltmeter usingICL7107and7SegmentDisplay
20. UPS/ EmergencyLightingSystems
21. Electric-dooropeners
22. InductionCooking
23. ACRegulator
24. BatterySupplied Vehicle-Power Supply
25. DesignaBPSKmodulation/demodulationsystem
26. DesignPulseAmplitudemodulationsystem.
27. DesignPulseCodemodulationanddemodulation.
28. Design Deltamodulationanddemodulation.
29. Design Quadraturephaseshiftkeyingmodulationanddemodulation.
30. Designfrequencyshift keyingmodulation anddemodulation

Blog

1. TransistorParameterModels
2. FETVsBJT
3. RoleofsemiconductordevicesinPowerElectronics
4. Futureof thenanoelectronics
5. Safetystandardsin electronicsindustries.
6. QuantumPhysics
7. 7GCommunicationSystem
8. WirelessPowerTransmissionSystem
9. PlasticSolarCellSystem
10. NanotechnologyinElectronics
11. HapticTechnology
12. Steadystateresponse ofanyprocess loop
13. Willaddition ofpoles /zeros affecttheperformanceof thesystem?
14. Willaddition ofpoles /zeros affect thestabilityofthe system?
15. HowcanaPID controllerimprovetheperformanceofthesystem?
16. Differentcontrolschemesandcriterionforselectionofappropriatecontactscheme
17. Handlingdigitaldevices
18. Significanceofnumbersystems
19. Impactofdigital electronicson industrydevelopment
20. LowpowerADCs
21. LowPinCountMicrocontrollers
22. High FrequencyconsiderationsinPowerElectronics
23. VARcompensation
24. VoltageDipRestorer
25. RegenerativeBraking

26. MultilevelInverters
27. ArewereadyfortheInformationwar?
28. 24 HourConnectivity-Boon orCurse
29. Personal datasecurity
30. Radarfor CarSafety
31. GPS Applications
32. MissionShakti

Survey

1. Transistorsandtheirpackaging
2. ApplicationsofRLCcircuitsinindustries
3. DifferentTypesofOscillatorsusedinindustries
4. WorldwideFabrication Labscenario
5. SolarPower Energygeneration inindia usingPVCells
6. RemoteSensingMethods
7. ElectronicSystemsinHealthcare
8. ElectronicsSystemsinDefense
9. MorphologicalOperators in ImageProcessing
10. BiggestSystemsin the World
11. DifferenttypesofPLCS
12. ComparisonsonPI,PID andPDcontroller.
13. Differenttypesof openloop processesused inindustry
14. Differenttypesofclosed loop processesusedinindustry
15. IEEEPapers
16. DigitalIntegratedCircuitsmanufacturingcompaniesacrosstheworldandtheirturnover(min 3)
17. UseofSuccessiveApproximationRegisterADCinadvancedmicrocontrollers
18. EffectsofPowerQualityissuesondigitalcircuits
19. Useof Microcontrollersin differentareasw.r.t industry4.0
20. ActivePowerDevices
21. Highvoltage DCTransmission(HVDC)
22. ElectricDrives
23. FlexibleACtransmissionsystems(FACTS)
24. Batteryenergystoragesystem (BESS)
25. Adverseeffects of 5G technology
26. IsIndiareadyforIndustry4.0?
27. Evaluationofperformanceof5G
28. Howradio MirchiWorks?-ATechnical Perspective
29. Indiansatelliteprogram
30. Bestsatelliteinternetprovider2020

CaseStudy

1. Processcarriedoutatfabrication LAB
2. Differentsolderingtechniques
3. Transitionfromvacuumtubestosolidstatedevices
4. Electronicsusedinboiler
5. Datacentersandtheir cooling
6. BiometricVotingMachine
7. SpeechSignalAnalysis
8. WeaponDetectionSystem
9. IntensityModulation Technique
10. Voicebased SecuritySystem
11. Differentcontrol systemand controlstrategies used in dairyindustry
12. ControlSystematPharmaceuticalindustry
13. ControlSystematThermalPowerplant
14. ControlSystematWaterPurificationplant
15. ControlSystematSugar factory
16. EvolutionofAutomationin IndianIndustries
17. Simulationbaseddigitalcircuitdesign
18. IntegratedCircuits:SSI, MSI,LSI,VLSI,ULSI
19. DigitalelectronicsinVehicularcommunication(Protocols,Circuits)
20. TransitionfromelectromechanicalsystemstoElectronicssystems
21. ApplicationofPowerElectronicsinAutomotivePowerGeneration
22. SMPS Applications in the PowerTrain System- The power train systems of HEVs,electric vehicles and ICE need the following SMPS conditioners such as: Regenerativebraking(AC/DC),On-boardcharger(AC/DC),Dual-batterysystem(DC/DC),Tractionmotor(DC/AC)
23. ElectricLocomotives
24. Aircraftpowersystem/SpaceShuttlePowerSupply
25. HybridElectricVehicles
26. GMRT
27. PASystem/HomeTheatreSystem
28. MissileGuidanceSystem
29. AirTrafficControl
30. SatelliteServiceforCrop Managementin India
31. 2GSpectrumdistributioninIndiaduring2005

AssessmentScheme:

MidSemesterExamination-
10MarksPresentation-15 Marks
Laboratory-10MarksCourse
Project - 10 MarksHome
Assignment - 10
MarksGroupDiscussion -15
Marks
End Semester Examination - 10
MarksComprehensiveVivaVoce -20
Marks

TextBooks:*(AsperIEEE format)*

1. VarshaAgrawalAnilK.Maini,ElectronicDevicesandCircuits,Wiley,KindleEdition
2. ThomasLFloyd:ElectronicDevices(ConventionalCurrentVersion),Pearson,10thEdition
3. NagrathGopal -ControlSystemEngineering
4. NormanNise-Control SystemsEngineering,Sixth Edition,Wiley
5. R.P.Jain,―ModernDigitalElectronics‖,TMH,2012,ISBN–13:978-0-07-066911-6.
6. MD Singh, KB Khanchandani; Power Electronics;2 nd Edition;TMH.
7. M.H.Rashid;PowerElectronicsCircuits,DevicesandApplications;3rdEdition;PHI
8. SimonHaykin,Principles ofCommunicationSystems,JohnWiley,2ndEd
9. LouisEFrenzel,PrinciplesofElectronicCommunicationSystems,TataMcGrawHillPublications,Third Edition.
10. H.TaubandD.Schilling, PrinciplesofCommunicationSystems ,TMH,2003.
11. SimonHaykin,Digital Communications,JohnWiley,2005
12. TheodoreS.Rappaport,WirelessCommunications:PrinciplesandPracticePearsonEducationIndia, 2009

ReferenceBooks:*(AsperIEEE format)*

1. RobertL. Boylestad, ElectronicDevicesandCircuitTheory, Pearson;11edition
2. MahmoodNahvi&JosephA.Edminister,Schaum'sOutlineofElectricCircuits,McGraw-HillEducation;6 edition
3. KatsuhikoOgata-ModernControlEngineering, PrenticeHall
4. AnilK.Maini:DigitalElectronics:PrinciplesAndIntegratedCircuits1stEdition,ISBN:978-0-470-51051-3
5. N.Mohan,T.M.UndelandandW.P.Robbins;PowerElectronics:Converters,Applications,and Design; 3rdedition; JohnWilleyandSons, Singapore.
6. P.C.Sen;ModernPowerElectronics;S.ChandandCo,NewDelhi.
7. B.P.Lathi,CommunicationSystems,BSPublication,2006.
8. B.Sklar,DigitalCommunication,Pearson,SecondEdition.

9. SimonHaykin,Analog&DigitalCommunications,WileyPublications.
10. WayneTomasi,ElectronicCommunicationSystems,FourthEdition.
11. SimonHaykin,DigitalCommunications,WileyPublications,FourthEdition.

MoocsLinksandadditionalreadingmaterial:

1. IntroductiontoElectronics:https://www.coursera.org/learn/electronics
2. LinearCircuits2:ACAnalysis:https://www.mooc-list.com/course/linear-circuits-2-ac-analysis-coursera
3. https://www.udemy.com/share/101GL4/(ElectricalEngineering:IntroductiontoSignalsand Systems)
4. https://www.udemy.com/share/101Yzu/ (Signalprocessingproblems,solvedinMATLABand in Python)
5. NPTEL:DigitalCircuitsByByProf.SantanuChattopadhyay,IITKharagpur,https://swayam.gov.in/nd1_noc19_ee51/preview
6. NPTEL:Courses-ElectricalEngineering-NOCFundamentalsofPowerElectronicshttps://nptel.ac.in/courses/108/101/108101126/
7. NPTEL: Wireless Communication-https://youtu.be/CUyF0YGIA5Y?list=PL3607D4A9E70266F9

CourseOutcomes:

1. Buildbasiccircuitsusingdifferent electronicdevices
2. Classifyvarioussignals andsystemsfordifferentapplications
3. Illustrateperformanceanalysisoffeedbackcontrolsystem
4. Constructdigitalcircuitsforvariousapplications
5. Choosetheappropriate powerdevicesandcircuitsforitsapplicationsinpowerelectronics
6. Describevariouscommunicationsystems

CO PO Map:

	Program Outcomes												Program Specific Outcomes			
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO13	PSO14	PSO15	PSO16
CO1	3	3	3	1	3	2	1	2	3	2	2	3	2			
CO2	2	2	3	1	3	2	1	2	3	2	2	2		3		
CO3	3	3	2	1	2	2	1	2	3	2	2	2				
C	3	3	3	1	3	2	1	2	3	2	2	3			3	

O4																
CO5	3	3	3	2	3	2	3	2	3	2	2	2				3
CO6	2	2	2	1	2	2	2	2	3	2	2	3				

FutureCoursesMapping:

Industrial Electronics, Industrial Automation, Robotics, Wireless Communication,Mechatronics, Hybrid/ElectricVehicles, EnergyHarvesting,Digital SignalProcessing

JobMapping:

This course will help the students to build foundation for interdisciplinary job opportunities inthefield of

1. Automation,
2. Robotics,
3. Automobiles,
4. Communicationetc

FNo.: 654

COURSECODE:MD2203
COURSENAME:MECHANICAL&SYSTEMENGINEERING

CoursePrerequisites:

Basicstatistics, Probabilitydistribution

CourseObjectives:

1. TointroducetheMechanicalandIndustrialEngineeringdisciplineanditsapplicationstostudents.
2. Developcapacitiesinintegratingknowledgeofdesignalongwithotheraspectsofvalueadditionin theconceptualizationand manufacturingstageofvarious products.
3. Todevelopanabilitytodesignasystem,component,orprocesstomeetdesiredneedswithinrealisticco nstraints
4. Toimpartknowledgeonselectionofsuitablemanufacturingprocessforthetypicalcomponent
5. TounderstandtheapplicationofvariousMechanicalMeasurementtechniquesinengineeringapplica tions.
6. Thiscourseprovidesasolidfoundationincoremechanicalandindustrialengineeringdisciplines,crit ical thinkingand problem-solvingskills

Credits:5 **TeachingSchemeTheory:3**Hours/Week

Tut:1 Hours/Week

Lab:**2**Hours/Week

CourseRelevance:

Mechanical and System Engineering has a strong flavor of design and hands-on experience. Thecourse includes a study of a number of engineering topics to design systems relevant to thecontemporaryindustries.Theareasintroducedaredesignphilosophy,HeatTransfer,ManufacturingSc ience,System Engineering.

SECTION-1

Topicsand Contents

- **MaterialsandMaterialSelection (4 Hours)**Types of Materials, Properties of materials, Effect of alloying elements, Application ofmaterialsinmechanical,chemical,electronicsandsoftwareindustry,SelectionofMaterial, Basic Heat Treatment Processes
- **ManufacturingProcesses (7Hours)**

Casting, welding, Brazing, Soldering, Material forming, Sheet Metal working, Surfacetreatments,MachiningProcesses,AdvancedMachiningProcesseslikeAdditivemanufacturing,PhotochemicalMachiningandLaserBeamMachiningetc.,AutomationandTypesofAutomation,Introduction toComputer IntegratedManufacturing

- **MechanicalMeasurement (5Hours)**

EngineeringMeasurements,MeasurementErrors,UncertaintiesofMeasurement,TemperatureMeasurement,PressureMeasurement,Forcemeasurement,StrainMeasurement, Torque Measurement, Velocity Measurement Flow Measurement TorqueMeasurement,Verniercalipers,MicrometerorScrewGauge,DialGaugeorDialIndicator,SpiritLevel,Concept of Geometricdimensioningand tolerancing.

- **DesignPhilosophy (4Hours)**

Engineering Design, Product Development Process, Problem, Types of Design, PhasesofEngineeringdesign,DefinitionandNeedIdentificationtoDetailedDesign,ErgonomicandAesthetic Aspects in Design,DesignforManufacturing

SECTION-2

- **OperationsStrategy (4Hours)**

Manufacturing vs Service Operations, Concept of Process as applied to manufacturingandservices,SIPOC(Supplier-Input-Process-Output-Customer),ProcessChoicesinManufacturing:Project,JobShop/JobOrder,Batch,Mass/Assembly,ContinuousProcess

- **QualityAssurance (7 Hours)**

Quality–Concept,Definitions,Qualityattributesforproducts &services,Cost&Valueofquality,Inspection–100%vsSampling,StatisticalProcessControl,TQM,SixSigmaConcept–Measurements,DMAIC&DMADV,7QCTools–Checksheets,Histogram,Fishbonediagram, Pareto diagram, ScatterDiagram

- **Logistics&SupplyChain Management (5Hours)**LogisticsManagement,Functions–Transportation,Warehousing,InventoryManagement, Material handling & Packaging, Order (Information) Processing, SupplyChain–Types:ProductSC,ServiceSparesSC,ServiceSC,SustainableSC–GreenSC,Reverse Logistics

- **ProjectManagement (4Hours)**

Projects–Definition,Characteristics,Classification,ProjectLifeCyclePhases–Concept/Initiation, Feasibility, Planning & Organization, Implementation, Clean-up &Shut Down Phase, Project Planning – Project Charter, Statement of Works, NetworkAnalysis – PERT/CPM

ListofTutorials:(AnyThree)

Inthetutorialstudentsareexpectedtopresentatechnicalseminar(PPT)relevanttoMechanicaland System Engineering (MSE). Also, students (in a group of 4/5 students) are expected todiscussanytechnical novel topic related toMechanical and System Engineering**.**

ListofPracticals: (AnySix)

1. TensiontestonMild SteelandAluminum
2. Brinellhardnesstestondifferentmaterials
3. DemonstrationonLatheMachine,MillinganddrillingMachine
4. DemonstrationofCNC LatheMachineOperation
5. Demonstrationofvarious weldingmethods
6. CoordinateMeasuringmachine
7. LaserBeamMachining
8. 3DPrintingMachine
9. InjectionMoldingMachine
10. Studyofbasicmeasuringinstruments,VernierCaliper,Micrometer,DialIndicator,ProfileProjector etc.
11. Experimentonprofileprojectorandvisionmeasuringsystem
12. Casestudyon Product Design Philosophy
13. Useof 7qualitytools implementation(usingMSExcel)
14. UseofStatisticalprocessControl(SPC)formanufacturing/Serviceindustry(usingMSExcel)
15. ImplementationofDefineandMeasurephaseofSixSigmatomanufacturing/Serviceindustry(usingstandard templates madeinMS Excel)
16. CasestudiesonOperationstrategies
17. ImplementationofProjectManagementconceptsformanagingprojects(usingMSExcel)

Listof CourseProjects:

1. Materialselection
2. Newmaterialdevelopment
3. Smartmaterialsusage
4. Manufacturingprocessselectionforcomplexparts
5. Useof manufacturingfor simple parts
6. Modelformeasurement system
7. Modelformeasuringinstrument
8. NewProductDesign forcustomersatisfaction
9. Operation strategyof manufacturing/serviceindustry
10. Implementation of Six sigma (At least first two phases i.e. Design and Measure) formanufacturingand serviceindustry
11. Useof seven qualitytools forimprovement ofproduct or servicequality
12. ImplementationofStatisticalProcessControl(SPC)formanufacturingorserviceindustry
13. Supplychainmanagement studyforamanufacturing/serviceindustry
14. Analysisoflogistics managementofamanufacturing/serviceindustry
15. ImplementationofProject Managementconceptsfor amanufacturing/serviceindustry
16. Useofsoftwareforprojectmanagement

Listof CourseSeminar Topics:

1. CompositeMaterialsandtheirapplications
2. AdditiveManufacturing
3. Design forManufacturing
4. LaserBeamMachining
5. PhotochemicalMachining
6. PCBManufacturing
7. Manufacturingofsemiconductordevices
8. Selectionofmaterial
9. Alloyingmaterials
10. MaterialsusedforAutomobileapplications
11. MaterialsusedforAerospaceandspaceapplications
12. EnergyManagement
13. Nonrenewable EnergySources
14. Pollutionandremedialmeasures forit
15. HeatTreatmentofmaterials
16. CoordinateMeasuringMachine
17. Noncontacttypeinspection methods
18. Geometricdimensioningandtolerancing
19. SIPOC formanufacturingindustry
20. SIPOCforserviceindustry
21. DIMAC

22. DMADV
23. Surfacetreatments
24. Six sigmaanditsapplications
25. Useof7 qualitytools
26. StatisticalProcess control formanufacturingindustry
27. StatisticalProcesscontrolforserviceindustry
28. Costof qualityand valueof quality
29. QualityPhilosophy
30. Introductiontologistics andsupplychainManagement
31. ApplicationsofSCMinvarioussectors
32. TypesofSCM
33. ProjectManagementBasics
34. UseofNetworkanalysisforprojectManagement
35. UseofCPM/PERTforprojectManagement
36. ProductLifecyclemanagement
37. Automationand Robotics
38. MetalMatrixcompositeprocessing
39. RecenttrendsinqualityManagement
40. TotalQualityManagement
41. SmartMaterials
42. ShapeMemoryAlloys
43. FrictionStirWelding
44. IncrementalSheetForming
45. CNCMachine
46. VirtualManufacturing

Listof CourseGroupDiscussionTopics:

1. Methodsofforcemeasurement
2. Forcesensingtechnology
3. Surfacemodificationtechnology
4. Applicationand useofcarbonfiber reinforcedplastic
5. Effectof nonmetallic alloyingelements
6. Materialsused inelectronic industry
7. Moderntrends inheat treatmenttechnology
8. Useofsimulation inmanufacturing
9. Electrochemicalmachining
10. Electrobeammachining
11. Waterjetmachining
12. Thermodynamiclaws-reallifeapplications
13. Measurementofheattransferrate
14. Lasermetrology
15. Virtualgauging
16. Design forinspection

17. Electronicgauges
18. Gaugingautomation
19. Useof nanotechnologyinmaterial science
20. Useofcomputers indesign anddevelopment process.includingCAE,CAM.
21. Useofhighlyreliableplasticmaterialsinengineering.
22. Emergingintegrationof mechanismwithelectronics.
23. Liberaluseofinstrumentationinmechanicalsystems
24. 3Dprintinginindustrialscale
25. MicroElectro-MechanicalSystems
26. Computeraidedmanufacturing
27. Justin timeproduction
28. Leanproduction
29. E-Supplychainmanagement
30. Automationand operation strategy
31. ShiftingfromB2Bmodel toB2B2Cmodel
32. Businessprocessmanagement
33. Sixsigmaforcontinuous businessgrowth
34. Qualitycircle
35. TheToyotaproductionsystem
36. TaguchiMethod
37. Zerodefectprogram
38. QFD
39. GreenSupplychainmanagement
40. Closed loop supplychain
41. Forecastingproductreturns
42. EffectofSCMonBIGdataand AI
43. Impactof Industry4.0onSCM
44. Resilientsupplychain
45. Sustainabilityissuesinsupplychain
46. Blocksupplychain
47. AIandProjectmanagement
48. IOTandprojectmanagement
49. RiskanalysisinProject Management
50. RoleofcomputerinProjectManagement

Listof HomeAssignments:

1. Stressstrainrelationshipforvariousductilematerials
2. Stressstrainrelationshipforvariousbrittlematerials
3. Systemandtypesof forces
4. Stress,strainandtheirtypes
5. Basicsof FactorofSafetyindesignandengineering
6. Engineeringmaterialsandtheirproperties
7. AlloysandCompositematerials
8. MaterialsforvariousEngineeringapplications
9. Selectionofmaterialfor variousindustrialapplications
10. Heattreatmentofengineeringmaterials
11. Selectionofmanufacturingprocesses forvariousindustrialapplications
12. Joiningprocessesandtheirapplications
13. Deformationprocesses andtheirapplications
14. Sheetmetaloperations
15. Conventionalandnon-conventionalmachiningprocesses
16. CastingProcessesandtheirapplications
17. Additivemanufacturing: conceptandapplications
18. Thermalmachiningprocesses
19. Chemicalandelectrochemicalmachiningprocesses
20. Mechanicalmachiningprocesses
21. Geometricdimensioningandtolerancing
22. Industrial automation:Historyanddevelopment
23. Computerintegratedmanufacturing
24. Heattransferconcept andapplications
25. Lawsofthermodynamics
26. Powergeneratingandpowerabsorbingdevices.
27. Manufacturingandserviceindustriesandoperations
28. SIPOCdiagram
29. Typesofproductionsystems
30. Qualityassuranceanditsrolein industries
31. Quality,itscostandvalue
32. QualitycontrolandSPC
33. TotalQualityManagement
34. SixSigma:Conceptandmethodology
35. Applicationsof7 QCtools
36. LogisticsManagementanditsfunctions
37. Supplychain Management and types of supplychain
38. ProjectManagement
39. Projectlifecycle
40. NetworkAnalysis
41. Projectcharter

Survey/Design(Broadareas)

1. Design of simplecomponents formanufacturability
2. Establishingpartdimensionsbasedonstressstraincalculations
3. DevelopmentofSIPOCdiagramforvariousprocesses
4. Datacollection,designofcontrolchartsforvariablesandtheirinterpretation
5. Six Sigma:Defineand measurephase
6. Problemsolvingusing 7 QC tools.

Design:

1. EngineeringDesignPrinciples
2. Design forManufacturing
3. DesignforAssembly
4. Asthetic Considerations in Design
5. ErgonomicconsiderationsinDesign
6. DesignforQuality
7. Design forSix Sigma
8. QualityFunctionDeployment

CaseStudy:

1. Casestudyonmaterialselection for electronic industry,chemicalindustry,aerospaceandautomobileindustryetc.
2. Casestudyon selection of manufacturingprocess forgiven component
3. Difficulttocutmaterialsandeffectivestrategiestomanufactureforthe same
4. Complexpartmeasurementusingmeasuringinstruments
5. Casestudyon CMM
6. Design thinkingcase study
7. Casestudyon selection of operation strategy
8. Useof DMAICforproduct company
9. UseofDMAICfor serviceindustry
10. Supplychainmanagement case study
11. Logisticsmanagementofindustry
12. Projectmanagementcasestudy

Blog

1. Newmaterials formanufacturingindustry
2. Materials forindustry4.0
3. SmartMaterials
4. Newproductdevelopment
5. MicroMachining
6. AdvancemachiningProcesses
7. RoboticsandAutomation
8. 3DMetalprinting

9. Supplychainmanagement andblockchain

10. Qualityneed of hour
11. LeanSix sigma
12. Projectmanagementtoolsandtechniques

Surveys

1. ManufacturingprocessesinIndustry
2. Useof Materials forindustryapplications
3. EffectivenessofCMM
4. Operationstrategiesofmanufacturingcompanies5. Operationstrategies for serviceindustry
6. Qualitycontrol in theeraof industry4.0
7. Machinevisionusages
8. Inlinegauging
9. Supplychain methodsused formanufacturingand serviceindustry
10. Projectmanagement principlesanditsexecution

AssessmentScheme:

MidSemesterExamination-
10MarksPresentation-15 Marks
Laboratory-10MarksCourse
Project - 10 MarksHome
Assignment - 10
MarksGroupDiscussion -15
Marks
End Semester Examination - 10
MarksComprehensiveVivaVoce -20
Marks

TextBooks:*(AsperIEEE format)*

1. *G.ShanmugamandS.Ravidran;BasicMechanicalEngineering;TataMcGrawHillPublications*
2. *S.Ramamrutham;StrengthofMaterials;15thEdition,DhanpatRaiPublishingCompany*
3. *Beer P. Johnson,E. Russell JohnstnJr.,JohnT. Dowolf,DavidF. Mazurek;MechanicsofMaterials, 2nd edition,McGrawHill publications.*
4. *P.N. Rao;Manufacturing Technology;VolI&II;Tata McGrawHill Publications*
5. *KalpakjianandSchmid,Manufacturingprocessesforengineeringmaterials(5thEdition)-Pearson India, 2014*
6. *VRaghavan;MaterialScienceandEngineering;PrenticeHallofIndia;New Delhi*
7. *P.K.Nag;EngineeringThermodynamics;Tata McGrawHillPublications*

8. *AmitavaMitra;FundamentalsofQualityControl&Improvement;2ndedition,PearsonEducation2002*
9. *SunilChopra&PeterMeindl,SupplyChainManagement-Strategy,Planning&Operation–Pearson Education*

ReferenceBooks: ***(AsperIEEE format)***

1. *GereandTemoshenko; MechanicsofMaterial;4thEdition,CBSPublishers*
2. *V.B.Bhandari,ElementsofMechanicalEngineering,TataMcGrawHillPublications*
3. *R.K. JainProduction Technology,Khanna Publishers*
4. *Chaudhari,Hajra;ElementsofworkshoptechnologyVolIandII;MediapromotersandPublishers*
5. *J.M.Juran& F.M.Gryna;QualityPlanningandAnalysis;5thEdition,McGraw-Hill,1993*
6. *Logistics &Supply ChainManagement: Cases andConcepts–Raghuram*
7. *YCengelandBoles;Thermodynamics-AnEngineeringApproach;TataMcGrawHillPublications*

MoocsLinksandadditionalreadingmaterial:

www.nptelvideos.in

1. https://swayam.gov.in/nd1_noc20_me67/preview:Fundamentals of manufacturingprocessing
2. https://www.coursera.org/learn/mechanics-1:Stressesandstrains
3. https://www.coursera.org/learn/thermodynamics-intro:Thermodynamics and Heattransfer
4. https://www.coursera.org/learn/uva-darden-project-management:ProjectPlanning
5. https://www.coursera.org/specializations/project-management:ProjectPlanning
6. https://www.coursera.org/learn/material-behavior:Materials
7. https://www.coursera.org/learn/six-sigma-principles
8. https://www.coursera.org/specializations/supply-chain-management

CourseOutcomes:

1. Developconceptualunderstandingofengineeringdesignfor anycomponent andalsotoselecttheappropriatemanufacturingmethods.
2. Selectthesuitablematerialbasedonitsmechanical,chemicalandotherproperties forgiven engineeringapplications.
3. Understandbasicsofthermodynamics,heattransferandsourcesof energy.
4. Understandnatureof manufacturingand serviceoperations; applyprinciplesofoperationsstrategyfor process choiceand planandorganizeprojects
5. Understandandapplyprinciples ofqualitymanagement,qualitytoolsandsixsigmamethodology
6. Identifythe keyelementsand processes in supplychain and their interaction

CO PO Map:

	Program Outcomes												Program Specific Outcomes			
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 13	PSO 14	PSO 15	PSO 16
CO1	3	2	2	2	2				3	2	2	2	2	2	1	1
CO2	3	2	2	2	2				3	2	2	2	2	2	1	1
CO3	3	2	2	2	2				3	2	2	2	2	2	1	1
CO4	3	2	2	2	2				3	2	2	2	2	2	1	1
CO5	3	2	2	2	2				3	2	2	2	2	2	1	1
CO6	3	2	2	2	2				3	2	2	2	2	2	1	1

FutureCoursesMapping:

Thiscoursewillmapto following coursesatTYandFinalyearof ProductionandMechanicalEngineering
MachiningProcesses,ManufacturingEngineering,MachineDesign,Operationsmanagement,ProjectManagement

JobMapping:

Withthesuccessfulcompletion ofthiscourse Studentscanacquireskillsrequiredforfollowingjob profileinmanufacturingand serviceindustry

1. ManufacturingEngineer
2. DesignEngineer
3. ProjectManager
4. QualityControl Engineer

FNo.: 654

CS2218: OBJECT ORIENTED PROGRAMMING

Course Prerequisites:
Basic course on programming

Course Objectives:

1. Understand Object Oriented programming concepts
2. Demonstrate Object Oriented programming concepts by writing suitable Java programs
3. Model a given computational problem in Object Oriented fashion
4. To develop problem solving ability using Object Oriented programming constructs like multithreading
5. Develop effective solutions using for real world problems using the concepts such as file handling and GUI
6. Implement applications using Java I/O and event-based GUI handling principles

Credits: 5 **Teaching Scheme Theory:** 3 Hours/Week
Tut: 1 Hours/Week
Lab: 2 Hours/Week

Course Relevance:
This is an important course for engineering students. It develops computational problem solving and logic building capability of students. Acquiring programming skills has a high relevance in all branches of Engineering. Once the student gains expertise in coding, this course proves to be beneficial to them to excel in industry demanding coding in specific software.

SECTION-1

Introduction:
What is Object Oriented Programming (OOP)? The need of OOP, Characteristics of OOP.

Java overview: Classes and Objects, Java object storage, Different ways to create objects in Java, Access Modifiers, this reference, main method, Static vs Instance block, Static methods vs Instance methods in Java, Object class, Static class in Java, operators, keywords in java.

Constructors: Constructors in Java, Default constructor, Parameterized constructor, Copy Constructor, Private Constructors and Singleton Classes.
Garbage Collection: Garbage Collection, How to make object eligible for garbage collection in Java?

Input and Output: Byte Stream vs Character Stream, Command Line arguments, use of Scanner Class, Scanner vs BufferReader Class, Formatted output, Reading input from console.

Arrays in Java: Arrays in Java, initialization, Default Array values, multi dimensional array, passing array to a function, Jagged arrays, java.util.Arrays class, string class, string buffer, string builder.

Methods in Java: Methods, Parameters passing, Returning Multiple values, Throwable fillInStackTrace() method in Java, Valid variants of main(), Variable Arguments (Varargs) method

Inheritance: Inheritance in Java, Types, Constructor in Inheritance, Using final with Inheritance, Accessing superclass member, Override private methods, Parent and Child classes having same data member, Base vs derived class reference. Polymorphism: Method Overloading, Overloading main(), Static vs Dynamic Binding, Method Hiding. Private and final methods, Passing and Returning Objects in Java

SECTION-2

Exception Handling: Exceptions, types, types of handling exception, Checked vs Unchecked Exceptions, Throw and Throws, User-defined Exception, Chained Exceptions.

Interfaces and Abstract Classes: Interface and its usage, Abstract Class and its usage, Difference between Abstract Class and Interface, Nested Interface, Nested Class, Inner class, Anonymous Inner class, Marker interface.

Java Packages: Packages Introduction, default access specifier use, dealing with package.

Collection in Java: Collections Class, Enumeration, Iterators and ListIterator, Using Iterators, Iterator vs Foreach, ArrayList, Vector, Map, Set.

Multithreading: Thread life Cycle, Thread Priority, Thread Methods, Inter-thread Communication, Synchronization, Method and Block Synchronization, Deadlock situation in threading.

File Handling & Database connectivity: File Processing, Primitive Data Processing, Object Data Processing,Wrapper classes, Connecting Java with database (JDBC/ODBC).

Java GUI: AWT, Swing, Components, design patterns. Layout Manager: Flow, Border, Grid and Card. Label, Button, Choice, List, Event Handling (mouse, key), Menus, Tables

List of CourseSeminar Topics:

1. Introduction of Arrays and 1D Array programming examples
2. Multidimensional arrays
3. Variants of main() and command line arguments
4. Input and Output stream classes
5. String concepts and various methods of comparing strings
6. Methods in Java
7. Java String Methods
8. Passing array to a function and Jagged array examples
9. Reading input using Scanner and BufferReader Class
10. String, String buffer and String builder
11. Types of Inheritance in Java
12. Implementation of Types using Constructor in Inheritance
13. Using final with Inheritance
14. Base vs derived class reference in Inheritance
15. Using final with Inheritance, Accessing superclass member
16. Parent and Child classes having same data member
17. Overriding, Hiding Fields & Methods
18. Static vs Dynamic Binding & Hiding Methods
19. Private and final methods
20. Passing and Returning Objects in Java
21. Java Memory Management
22. File handling in Java vs C++
23. Data types used in Java vs C++
24. Java Object Serialization and Deserialization
25. Operator precedence
26. Use of Object Class Methods
27. Garbage collection in JAVA
28. Use of Static Blocks in various applications
29. Keywords used in JAVA
30. Types of Variables In JAVA

List of Group Discussion Topics:

1. Checked and unchecked exception, user defined and standard exception
2. Abstraction in Java and different ways to achieve Abstraction
3. Packages in Java – Types, Advantages & Techniques to Access Packages
4. Inner classes, nested interfaces in Java
5. Difference between Interfaces and abstract classes in Java
6. Exception Handling in Java Vs CPP
7. Difference between 1) throw and throws. 2) Final, finally and finalize in Java

8. Discuss Exception propagation and Discuss Exception handling with method overriding in Java
9. Discuss Packages, Access specifiers and Encapsulation in java.
10. Difference between abstraction and encapsulation in Java.
11. Daemon Threads Vs user threads
12. Preemptive scheduling Vs slicing
13. Is it possible to call the run()method directly to start a new thread? pls comment
14. Arraylist Vs Vector
15. Arrays Vs Collections
16. is Iterator a class or an Interface? what is its use?
17. List Vs Set
18. BufferedWriter and BufferedReader classes in java
19. BufferedReader Vs Scanner class in java
20. Buffered Reader Vs FileReader in java
21. Instanceofjava
22. Difference between CPP and JAVA
23. Difference between JDBC and ODBC connectivity
24. file processing in java
25. Difference between premitive data processing and object data processing
26. Creating GUI using swing
27. comparision between Swing, SWT, AWT, SwingX, JGoodies, JavaFX, Apache Pivot
28. Introduction To JFC And GUI Programming In Java
29. Introduction to wrapper classes
30. Why java uses Unicode System?

List of Practicals:

1. Implement Student class using following Concepts
   - All types of Constructors
   - Static variables and instance variables
   - Static blocks and instance blocks
   - Static methods and instance methods

2. There is a class Adder which has two data members of type 1D int array and int variable. It has two functions: getdata and numsum. Function getdata accepts non-empty array of distinct integers from user in 1D int array data member and a targetsum in another data member. The function numsum adds any two elements from an input array which is equal to targetsum and return an array of resulting two elements, in any order. If no two numbers sum up to the target sum, the function should return an empty array. Note that the target sum is to be obtained by summing two different integers in the array; you can't add a single integer to itself in order to obtain the target sum. You can assume that there

will be at most one pair of numbers summing up to the target sum. Use constructor. Use extra variables if needed

Input:
Array=[3,5,-4,8,11,1,-1,7] targetsum=15
Output: [8,7]
Input:
Array=[3,5,-4,8,11,1,-1,6] targetsum=15
Output: []

3. Write Java program to calculate area of triangle, square & circle using function overloading. Function parameter accept from user (Use function Overloading concepts and Inheritance).
4. Write a program for following exception, develop a suitable scenario in which the following exceptions occur:
    a. divide by zero
    b. Array index out of bounds exception
    c. Null pointer Exception
5. Write a java program to solve producer-consumer problem where there are two producer threads and one consumer thread.

6. Implement various operations using JDBC Connectivity.
7. Display bank account information (Use interface and inheritance using java)
8. Develop a GUI in java which reads, update the file.

List of Course Projects:

Topics of Course Project would be discussed in Lab session.

List of Home Assignments:

Blog:

1. Single and Multidimensional arrays in Java
2. Comparison Inheritance & Polymorphism
3. Need of abstract classes and interfaces in Java
4. Multithreading concept in Java
5. Signed & Unsigned arithmetic operations using JAVA
6. Role of start() and run() methods in multithreading

Survey:

1. Strategies for Migration from C++ to Java
2. Product development using Inheritance and Polymorphism in Industry
3. on Java/OOP features popular amongst developers
4. Which other (non-JVM) languages does your application use?

5. How Java Impacted the Internet
6. How can an ArrayList be synchronised without using vector?

Design:

1. Implementation of Singleton design pattern in Java
2. Notes Repository System for Academic
3. Design for employee management system
4. Design for student management system
5. Inventory Management System
6. Write a program to delete duplicate numbers from the file

Case Study:

1. Java development milestones from 1.0 to 16.0
2. Implementation of Different Methods in Polymorphism
3. Real world systems which use java for its implementation
4. Drawing a flag using java
5. Use of different methods of Class object
6. Drawing a flag using java

Assessment Scheme:

Mid Semester Examination - 10 Marks
Presentation - 15 Marks
Laboratory - 10 Marks
Course Project - 10 Marks
Home Assignment - 10 Marks
Group Discussion - 15 Marks
End Semester Examination - 10 Marks
Comprehensive Viva Voce - 20 Marks

Text Books:

1. *Herbert Schildt, "JAVA- The Complete Reference", 11th Edition, McGraw Hill Education*

Reference Books:

1. *Bruce Eckel, "Thinking In Java – The Definitive Introduction to Object-Oriented Programming in the Language of the World-Wide Web", Fourth Edition, Pearson Education, Inc.*
2. *R. Morelli and R. Walde, "Java, java, Java – Object-Oriented Problem Solving", 3rd edition, Pearson Education, Inc.*

Moocs Links and additional reading material:

Programming using Java| Java Tutorial | By Infosys Technology
https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_01304972186110361645_shared/overview

An Introduction to Programming through C++ – Prof A.G. Ranade- NPTEL- computer science and engineering – NOC https://nptel.ac.in/courses/106/101/106101208/#

Course Outcomes:

The student will be able to –
1. Understand object-oriented programming features
2. Develop real world applications using class, inheritance and polymorphism
3. Adapt Best Practices of Class Design by using Standard Templates Library
4. Solve computing problems by applying the knowledge of Exception handling and Multithreading
5. Design solutions by choosing suitable data structures such as Array, Vector, Map etc
6. Implement applications using Java I/O and event-based GUI handling principles

CO-PO Map

CO	Programme Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2				3							3			
CO2	3		3		3	3	2	2	3						3	3
CO3	3		3		3		2	2	2						3	
CO4	2	2		3										3		
CO5	3		3		3		2	2	2	3	3				3	
CO6	2	2				3						3				2

Future Courses Mapping:

Advanced Data Structures, Advanced Java, Spring Frame Work, Grails Frame Work

Job Mapping:

Java Programmer, Application Developer, Design Engineer, Senior Software Developer

IT2263: Software Development Project -I

Course Pre-requisites:C, C++, Java, Android and Web Technologies

Course Objectives:

1. To enhance problem solving skills by independent learning
2. To emphasize learning activities that are long-term, interdisciplinary and student-centric.
3. To engage students in rich and authentic learning experiences.
4. To provide every student the opportunity to get involved individually to learn professionalism
5. To inculcate research culture and attitudes towards learning among the students.
6. To improve employability skills of students

Credits: 3 **Teaching Scheme Lab:** 2 Hours/Week

Course Relevance: Software Project Development comes under the category of Project Based Learning (PBL). For better learning experience, along with traditional classroom teaching and laboratory work-based learning, project-based learning has been introduced with an objective to motivate students to learn how to solve a problem. Students may work on problems innovatively in different domains like social, technical, cultural and scientific.

Teacher's Role :

- Teacher will act as the facilitator and mentor.
- To utilize the principles of problem solving, critical thinking and metacognitive skills of the students.
- To make the individual aware of time management.
- To Help students to solve technical problems
- To assess and evaluate student performance by monitoring regularly on a weekly basis.

Recommended Guidelines:

1. SDP is a Project Based Learning. PBL is learning through activity. One of the faculty can be appointed as coordinator for SDP.
2. Following are the recommended guidelines that will work as an initiator and facilitator in the process of completion of SDP.
3. In the first week of commencement of semester let the coordinator create awareness about SDP (what, why, and how) among the students. Convey students expected outcomes, assessment process and evaluation criteria.
4. Assign mentor batch wise.
5. Provide guidelines for title identification (Problem can be some real life situation that needs technology solutions. This situation can be identified by meeting people around, visiting various industries, society, and institutes. The solution can be prototype, model, convertible solutions, survey and analysis, simulation, and similar).
6. Let students submit the problem identified in prescribed format (Title, Problem statement, domain, details of a problem undertaken, and what is need of solution to the problem)
7. Coordinator and Mentor can approve the problem statements based on feasibility and learning outcomes expected for second year engineering students.
8. Mentor is to monitor progress of the task during phases of project work. Broadly phases may include- literature survey, requirements gathering, preparing a solution, designing solution, Implementing and testing the solution.
9. Weekly monitoring and continuous assessment record is to be maintained by mentors.
10. Get the IEEE paper format as a report submitted at the end of semester.
11. In semester evaluation will be done by a mentor along with internal faculty as a jury and at the end of semester will be evaluated by industry experts.

Sample Software Project Statement based on Java ,C,C++, Android, Web technologies

1. QR Code bases contactless ordering
2. ATM Simulator
3. Drivers Booking Website
4. Document Scanner app
5. Campus canteen management system
6. movie ticket booking system

7. Covid-19 Live Statistical Analysis

...not limited to.....

Faculty and students are free to include other area which meets the society requirements at large

Course Outcomes:

The student will be able to –

1. Find the real-life problem from societal need point of view

2. Compare different approaches and select the most feasible one.

3. Analyze and synthesize the identified problem from technical viewpoint

4. Design and develop an optimal and reliable solution to meet objectives

5. Validate the solution based on the criteria specified

6. Inculcate long life learning and research attitude among the students

CO PO Map:

	Program Outcomes												Program Specific Outcomes			
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO13	PSO14	PSO15	PSO16
CO1	1	3	3			3								3		
CO2	2			1	2										2	
CO3	3		3		2			3	1				3			
CO4	2	2				3										
CO5	3		3				3		3		3				3	3
CO6	3	2			2					3		3				

CO attainment levels:

CO	CO1	CO2	CO3	CO4	CO5	CO6
Level	4	2	4	5	1	3

Job Mapping: Software Engineer,WebDeveloper,Android Developer

FF No. : 654

IT2264::Engineering Design and Innovation

Course Relevance: Project Centric Learning (PCL) is a powerful tool for students to work in areas of their choice and strengths. Along with course-based projects, curriculum can be enriched with semester long Engineering Design and Development courses, in which students can solve socially relevant problems using various technologies from relevant disciplines. The various socially relevant domains can be like Health care, Agriculture, Defense, Education, Smart City,Smart Energy and Swaccha Bharat Abhiyan. To gain the necessary skills to tackle such projects,students can select relevant online courses and acquire skills from numerous sources under guidance of faculty and enrich their knowledge in the project domain, thereby achieving project centric learning. Modern world sustained and advanced through the successful completion of projects. In short, if students are prepared for success in life, we need to prepare them for a project-based world. It is a style of active learning and inquiry-based learning. Project based learning will also redefine the role of teacher as mentor in the learning process. The PCL model focuses the student on a big open-ended question, challenge, or problem to research and respond to and/or solve. It brings students not only to know, understand and remember rather it takes them to nalyze, design and apply categories of Bloom's Taxonomy.

SECTION-1

Preamble - The content and process mentioned below is the guideline document for the faculties and students to start with. It is not to limit the flexibility of faculty and students;rather they are free to explore their creativity beyond the guideline mentioned herewith. For all courses of ED, laboratory course contents of "Trends in Engineering Technology" are designed as a ladder to extend connectivity of software technologies to solve real world problems using an interdisciplinary approach. The ladder in the form of gradual steps can be seen as below:

Industry Communication Standards, Single Board Computers and IoT, Computational Biology(Biomedical and Bioinformatics), Robotics and Drone, Industry 4.0 (Artificial Intelligence,Human Computer Interfacing, 5G and IoT, Cloud Computing, Big Data and Cyber Securityetc).

Suggest an assessment Scheme:

MSE and ESE

Text Books: (As per IEEE format)

1. A new model of problem-based learning. By Terry Barrett. All Ireland Society for higher education (AISHE).

ISBN:978-0-9935254-6-9; 2017

2. Problem Based Learning. By Mahnazmoallem, woei hung and Nada Dabbagh, Wiley Publishers. 2019.

Stem Project based learning and integrated science, Technology, Engineering and mathematics approach. By

Robert RobartCapraro, Mary Margaret Capraro

Reference Books: (As per IEEE format)

1. De Graaff E, Kolmos A., red.: Management of change: Implementation of problem-based and project-based

learning in engineering. Rotterdam: Sense Publishers. 2007.

2. Project management core textbook, second edition, Indian Edition , by Gopalan.

3. The Art of Agile Development. By James Shore & Shane Warden.

Moocs Links and additional reading material: www.nptelvideos.in

Course Outcomes:

On completion of the course, learner will be able to–

CO1: Identify the real life problem from societal need point of view

CO2: Choose and compare alternative approaches to select most feasible one

CO3: Analyze and synthesize the identified problem from technological perspective

CO4: Design the reliable and scalable solution to meet challenges

CO5: Evaluate the solution based on the criteria specified

CO6: Inculcate long life learning attitude towards the societal problems

CO-PO Map:

CO	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO13	PSO14	PSO15	PSO16
CO1	1	3	3			3								3		
CO2	2			1	2										2	
CO3	3		3		2			3	1				3			
CO4	2	2				3										
CO5	3		3				3		3		3				3	3
CO6	3	2			2					3		3				

FF No. : 654

IT2250::Data Structures

Course Prerequisites: Basic programming Skills (C/C++).

Course Objectives:

1. To impart the basic concepts of data structures and algorithms.

2.To understand concepts about searching and sorting techniques.

3. To construct and implement various data structures and abstract data types including lists, stacks, queues, trees, and graphs.

4. To make understand about writing algorithms and step by step approach in solving problems with the help of fundamental data structures.

5. To emphasize the importance of data structures in developing and implementing efficient algorithms.

Credits: 5 **Teaching Scheme Theory:** 3 Hours/Week

Tut: 1 Hours/Week

Lab: 2 Hours/Week

Course Relevance: This isa basic Course for Computer Engineering and allied branches. This course has a high relevance in all domains of computer engineering such as in Industries; research etc. as a basic prerequisite course.

SECTION-1

Arrays, Stacks, Queues and Linked Lists.

Arrays: Representation and application of Single and Multidimensional arrays, Time & Space Complexity Analysis.

Sorting Techniques: Quick Sort, Heap sort with Analysis.

Searching techniques: Linear Search, Binary search with Analysis.

Linked Lists: Dynamic memory allocation, Singly Linked Lists, Doubly linked Lists, Circular linked lists and Generalized linked lists, Applications of Linked list.

Stack: Stack representation and Implementation using arrays and Linked lists. Applications of

stack in Recursion, Expression conversions and evaluations.

Queues: Representation and implementation using array and Linked lists, Types of queue. Applications of Queues: Job Scheduling, Josephus problem etc.

SECTION-II

Trees, Graphs and Hashing.

Trees:-Basic terminology, representation using array and linked lists. Tree Traversals: Recursive and Non recursive, Operations on binary tree. Binary Search trees (BST).

Advanced Trees: Introduction, AVL tree, R-B tree, B tree and B+ tree.

Graphs: Terminology and representation using Adjacency Matrix and Adjacency Lists, Graph Traversals and Application: BFS and DFS, Connected graph, Bipartite Graph, Detecting Cycle in graph. Minimum Spanning tree: Prims and Kruskal's Algorithm, Shortest Path Algorithms, Union Find.

Hashing: Hashing techniques, Hash table, Hash functions. Collision handling and Collision resolution techniques.

List of Tutorials: (Any Three)

1) Sorting Techniques: Insertion, Merge sort, Bubble, Shell Sort, Radix Sort.
2) Searching Techniques: Ternary Search, Fibonacci Search.
3) Problem solving using stack (Maze problem, Tower of Hanoi).
4) Expression conversion like infix to prefix and postfix and vice versa.
5) Priority Queues and Job Scheduling Algorithm.
6) Generalized Linked Lists.
7) Threaded Binary tree and Stack less Traversals using TBT.
8) B and B+ Tree.
9) Applications of Graph in Network problems.
10) Design of Hashing Functions and Collision Resolution techniques.
11) Cuckoo Hashing.

List of Practicals: (Any Six)

1) Assignment based on Sorting and Searching.
2) Assignment based on Stack Application (Expression conversion etc.)
3) Assignment based on Queue Application (Job scheduling, resources allocation etc.)
4) Assignment based on linked list.
5) Assignment based on BST operations(Create, Insert, Delete and Traversals)
6) Assignment based on various operations on Binary Tree (Mirror image, Height, Leaf node display, Level wise display etc.)
7) Assignment based on AVL and R-B tree.
8) Assignment based on DFS and BFS
9) Assignment based on MST using Prim's and Kruskals Algorithm.
10) Assignment based on Finding shortest path in given Graph.
11) Assignment based on Hashing.

List of Projects:

1. Finding Nearest Neighbors.
2. Calendar Application using File handling.
3. Path finder in Maze
4. Word Completion Using Tire.
5. Bloom Filters.
6. Different Management Systems.
7. Scheduling Applications and Simulation.
8. Shortest Path Applications. (Kirchhoff's Circuit, TSP with Scenario.)
9. Efficient Storage and Data Retrieval Systems.
10. Different Gaming Application.

List of Course Seminar Topics:

1. Asymptotic Notations in Data structures.
2. Hash Table, Heaps and Their applications.
3. Analysis of Merge Sort, Quick Sort and Bubble Sort for Best, Average and Worst Case.
4. Solving N-queen and Josephus Problem using Backtracking, Stack and Queue respectively.
5. Priority Queue in Job Scheduling.
6. Application of Stack in Backtracking problems.
7. Priority Heap and min-Max Heap.
8. Data Structures for Languages and Libraries.
9. Multidimensional and Special Data Structures.
10. Algorithm Designing using Divide and Conquer

List of Course Group Discussion Topics:

1. Application based comparison of Sorting Algorithms.
2. Graphs vs Tree Data Structures: Application based comparison? Which is best? Why? How?
3. Advanced trees: which is the best? (AVL,RB,B,B+) when? how? why?
4. Scenario Based Comparison: Kruskals vs Prims Algorithm.
5. Hashing application in today's technology. Is it necessary?
6. Application based comparison: Stack vs Queues.
7. B- Tress VS B+ Trees: Which is to be consider? When ? Why?
8. Need and Role of Different tree Traversals.
9. Graphs vs Tree Data Structures: Application based comparison? Which is best? Why? How?
10. Linked List application in today's technology. Is it necessary?

List of Home Assignments:

Design:

1. Design Single Source multiple destination Shortest Path Algorithm For Driving Application.
2. Expression Tree and Topological Sorting application in Problem solving.
3. Scheduling Algorithms using Queue.
4. Implementation of B and B+ trees for database management.
5. GLL application to Solve problems on Multivariable Polynomial. Consider suitable example.

Case Study:

1. Consider a Suitable Example for Hashing Application. Study its Merits, Demerits and Design.
2. Consider different real life examples where different sorting, Searching techniques have been used. Why used? How? Comparative study.
3. Why there is a need of different tree traversal algorithms? Consider different real life examples where they are used. Why? How?
4. Game Base study for data structures.
5. Compare different graph traversal algorithm by considering different real life examples where they have used.

Blog:

1. Comparative Application of Prims vs Kruskals Algorithm in real life scenarios.
2. AVL Tree vs RB Tree with applications
3. Need of different Sorting techniques.
4. How Hashing is useful in recent technologies? Consider any application related to it.
5. Role of Stacks and Queues in problem Solving

Surveys:

1. How application of Graph Search Algorithms (DFS and BFS) is there in recent technologies? Consider some real life technologies.
2. How Advanced Trees Data structure plays important role in Database management?
3. Survey of Data Structures for computer Graphics applications.
4. A survey on different hashing Techniques in programming.
5. Graph algorithms in Network Application.

Suggest an assessment Scheme:

1. Home Assignment
2. MSE & ESE
3. Quiz
4. Seminar
5. Group Discussion
6. LAB-Course Assignment and Project Evaluation

Text Books: (As per IEEE format)

1. E. Horwitz , S. Sahani, Anderson-Freed, "Fundamentals of Data Structures in C",2nd Edition, Universities Press.

2. Y. Langsam, M.J. Augenstein, A.M.Tenenbaum, "Data structures using C and C++", 2nd Edition, Pearson Education

3. Narasimha karumanchi, "Data Structures and Algorithm Made Easy", 5th Edition, Career Monk publication

Reference Books: (As per IEEE format)

1. J. Tremblay, P. Soresan, "An Introduction to data Structures with applications", 2nd Edition, TMH Publication

Moocs Links and additional reading material:

1. www.nptelvideos.in
2. www.geeksforgeeks.org

Course Outcomes:
The student will be able to –

1)To interpret and diagnose the properties of data structures with their memory representations and time complexity analysis.

2)To use linear data structures like stacks, queues with their application.

3)To implement operations like searching, insertion, deletion, traversing mechanism etc. on various data structures with the help of dynamic storage representation.

4)To demonstrate the use of binary tree traversals and to perform various operations on Non-linear data structures.

5) To analyze the Graph data structure and to solve the applications of Graph data structures.

6)To design the appropriate data structure by applying various hashing Techniques.

CO PO Map:

	Program Outcomes												Program Specific Outcomes			
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO13	PSO14	PSO15	PSO16
CO1	3	3	1	2	2		1									
CO2	2	2	3									3				
CO3	3		3			2										
CO4	1				3	3			1		2					
CO5	2	3	2											3		
CO6	2		3					2	2	3			3		3	3

CO attainment levels:

CO	CO1	CO2	CO3	CO4	CO5	CO6
Level	1	2	3	5	4	3

Future Courses Mapping: Advanced Data Structures, Design and Analysis of Algorithms, Operating Systems, Compiler Design, Systems Programming, Data Science and similar courses.

Job Mapping: Data Structures and Algorithm is must necessary part of any programming job.

Without Data structures it is not possible to be good in Competitive coding. All Industries always looks for a strong knowledge in Data structures. Without learning this course, one can't imagine a job in computer/IT related industries and research.

FF No. : 654

IT2251::Computer Architecture and Operating System

Course Prerequisites: Basics of Computer System, Data Structures and Programming languages

Course Objectives:

1. To illustrate the structure, function, characteristics and performance parameters of a computer system.
2. To explore several computer architectures.
3. To discuss memory organization in computer system.
4. To understand the basic concepts and functions of the operating system.
5. To gain knowledge of process synchronization, its mechanism and CPU scheduling
6. To get familiar with deadlock and memory management techniques as a function of the operating system.

Credits: 5 **Teaching Scheme Theory:** 3 Hours/Week

Tut:1 Hours/Week

Lab:2 Hours/Week

Course Relevance: This course focuses on CISC and RISC computer architecture. The Operating System acts as a platform for information exchange between your computer's hardware and the applications running on it. A computer software/hardware architect is deeply involved in the development and design of new software or hardware.

SECTION-1

Introduction: Evolution of Computer Systems, Basic Operation of a Computer, Memory Addressing and Languages, Software and Architecture Types
CISC: Architecture of 8086, Instruction types, instruction format, instruction cycle, Addressing Modes, Assembly Language Programming of 8086,
RISC: Architecture, Instruction set, Pipelining, Programming and Application
Measuring CPU performance: Choice of benchmarks, summarizing performance results, Amdahl's law
Control Unit: Single Bus CPU organization, register transfers, performing an arithmetic/ logic operation, fetching a word from memory, storing a word in memory, Execution of a complete instruction. Micro-operations, Hardwired Control, Micro-programmed Control: Microinstructions
M**emory System:** Need of memory system, Hierarchical memory system, Characteristics, Size,

Access time, read cycle time and address space, Processor memory interaction, Static and Dynamic ram, Memory interfacing and addressing, Memory hierarchy design, Cache memory: Cache size vs block size, Mapping functions

SECTION-1I

Overview of Operating System: What is OS?, Interaction of OS and hardware, Goals of OS, Basic functions of OS, OS Services, System Calls, Types of system calls, Types of OS: Batch, Multiprogramming, Time sharing, Parallel, Distributed & Real-time OS

Process management: Process Concept, Process States: 2, 5, 7 state models, Process Description, Process Control, Multithreading models, Thread implementations – user level and kernel level threads, Concurrency: Issues with concurrency, Principles of Concurrency, Mutual Exclusion: OS/Programming Language Support: Semaphores, Mutex , Classical Process Synchronization problems, Uniprocessor Scheduling, Scheduling Algorithms: FCFS, SJF, RR, Priority.

Deadlock: Principles of deadlock, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Deadlock Recovery, **Memory Management:** Requirements, Memory Partitioning, Fragmentation, Placement Strategies: First Fit, Best Fit, Next Fit and Worst Fit, Paging, Segmentation, Address Translation, Virtual Memory, VM with Paging, Page Table Structure, Translation Lookaside Buffer, Page Size, VM with Segmentation, Page Replacement Policies: FIFO, LRU, Optimal

List of Tutorials: (Any Three)

1) Instructions encoding.
2) Performance parameter (Amdahl's law)
3) Performance through pipelining.
4) Control Unit: Micro-operation and Micro-instruction.
5) Cache mapping functions.
6) Draw the Gantt charts and compute the finish time, turnaround time and waiting time for the following algorithms:
   a) First come First serve b) Shortest Job First (Preemptive and Non preemptive)
   c) Priority (Preemptive and Non preemptive) d) Round robin
7) Check whether the given system is in a safe state or not using Banker's Deadlock Avoidance algorithm.
8) Check whether the given system is in a deadlock state or not using the Deadlock Detection

algorithm.
9) Using the following placement algorithm, check whether memory can be allocated to a given process or not.
a) First fit b) Best fit c) Worst fit d) Next fit
10) Calculate the number of page faults for a reference string for the following page replacement algorithms:
a) FIFO b) LRU c) Optimal

List of Practicals: (Any Six)

1) Write an ALP to perform arithmetic operations.
2) Write an ALP using an array.
3) Write an ALP using stack memory.
4) RISC Programming
5) Execution of Basic and Advanced Linux commands
6) Write a shell script program.
7) Write a program demonstrating use of different system calls.
8) Implementation of Classical problems using Threads and Mutex/Semaphore.
9) Write a program to compute the finish time, turnaround time and waiting time for the following algorithms:
a) First come First serve b) Shortest Job First (Preemptive and Non preemptive)
c) Priority (Preemptive and Non preemptive) d) Round robin
10) Write a program to check whether given system is in safe state or not using Banker's Deadlock Avoidance algorithm
11) Write a program for following placement algorithm check whether memory can be allocated to given process or not by using following methods:
a) First fit b) Best fit c) Worst fit d) Next fit
12) Write a program to calculate the number of page faults for a reference string for the following page replacement algorithms:
a) FIFO b) LRU c) Optimal

List of Projects:

1. Linux based application using Shell Scripting
2. Design and implementation of a Multiprogramming Operating System: Stage I
i. CPU/ Machine Simulation
ii. Supervisor Call through interrupt
3. Design and implementation of a Multiprogramming Operating System: Stage II
i. Paging
ii. Error Handling
iii. Interrupt Generation and Servicing
iv. Process Data Structure
4. Design and implementation of a Multiprogramming Operating System: Stage III
i. Multiprogramming

ii. Virtual Memory
iii. Process Scheduling and Synchronization
iv. Inter-Process Communication
v. I/O Handling, Spooling and Buffering

5. Design and implementation of a Multiprogramming Operating System for arithmetic and logical operations: Stage I
i. CPU/ Machine Simulation
ii. Supervisor Call through interrupt
6. Porting of Linux on Embedded Platform and basic I/O programming
7. Comparison of various processors using simulators.
8. RTOS Programming
9. Designing of CPU
10. Linux kernel programming
11. Parallel Computing using CUDA

List of Course Seminar Topics:

1. Pentium Processor - a complete architecture
2. Microprogram sequencing
3. Improvement of Performance Measurement of Processor: Memory Banking
4. GPU Architecture
5. Micro-Programmed Control Unit used in Recent Computer.
6. Parallel Computers
7. I/O processors
8. Effect of clock on CPU performance
9. Edge computing
10. In-Memory Computing
11. Computer Architectures for vision system
12. RISC -V architecture
13. Cyber Physical Systems
14. Cyber System Debugging
15. Neuromorphic computing
16. Quantum Computing
17. The Challenges of Building Inferencing Chips
18. Hardware accelerator in computer architecture

List of Course Group Discussion Topics:

1. OS Structures
2. System call Vs API
3. Classical process synchronization problems
4. Process Vs Threads
5. Interprocess Communication (IPC)
6. Real Time Scheduling
7. Disk Scheduling
8. Best OS for smartphones-Android, iOS, windows, blackberry
9. Shared and Distributed Memory microprocessor
10. Flynn's Taxonomy
11. Booting Process of different Operating Systems.

List of Home Assignments:

Design:

1. Report Generation using Shell Script and AWK
2. Library Management System using Shell
3. Inter Process Communication in Linux
4. Design any real time application using job scheduling
5. Design any application using Android
6. DRAM design
7. Embedded System design
8. Real Time System design

Case Study:

1. Intel I3
2. Intel I7
3. Microsoft Windows 10
4. Linux
5. Android
6. Raspberry PI
7. NVIDIA core
8. Supercomputer architecture

Blog:

1. ARM Vs Intel
2. Protection and Security of OS
3. Comparative study of different mobile OS
4. Operating Systems for IoT Devices
5. Performance Measurement of CPU: Pipelining
6. ARM Microcontroller versions
7. Operating System Forensics

8. IOT Architecture

Surveys:

1. Computer System Memory Management and Optimization Techniques
2. Multiprocessor organization
3. A Survey of Mobile OS
4. Analysis and Comparison of CPU Scheduling Algorithms
5. Malware Analysis, Tools and Techniques
6. Laptop Operating Systems
7. Desktop Operating Systems
8. Pipelining hazards
9. Elements of modern computers

Suggest an assessment Scheme:

1.Home Assignment: Design, Case study, Blog and Survey
2.MCQ
3.CVV
4.Seminar
5.Group Discussion
6.LAB-Course Assignment and Project Evaluation

Text Books: (As per IEEE format)

1. William Stallings; "Computer Organization and Architecture: Designing for Performance";7th Edition; Pearson Prentice Hall Publication;ISBN 81-7758-9 93-8
2. C. Hamacher, V. Zvonko, S. Zaky;"Computer Organization"; 5th Edition;Tata McGraw Hill Publication; ISBN 007-120411-3
3. Douglas Hall;"Microprocessors and Interfacing";2ndEdition; Tata McGraw Hill Publications; ISBN 0-07-025742-6
4. Stalling William;"Operating Systems"; 6th Edition; Pearson Education;
5. Silberschatz A., Galvin P., Gagne G.;"Operating System Concepts" ; 9th Edition; John Wiley and Sons
6. John L. Hennessy, David A. Patterson; " Computer Architecture-A Quantitative Approach", 5th edition, Elsevier Publication
7. Andrew Sloss, Dominic Symes, Chris Wright; "ARM System Developer's guide Designing and optimizing system software"; Elsevier Publication

Reference Books: (As per IEEE format)

1.Hwang and Briggs; "Computer Architecture and Parallel Processing"; Tata McGraw Hill Publication; ISBN 13: 9780070315563.
2. A. Tanenbaum; "Structured Computer Organization"; Prentice Hall Publication; ISBN 81 – 1553-7.

3. Silberschatz A., Galvin P., Gagne G; "Operating System Principles"; 7th Edition, John Wiley andSons.
4. YashavantKanetkar; "Unix Shell Programming"; 2nd Edition, BPB Publications
5. Sumitabha Das; "Unix Concepts and Applications"; 4th Edition, TMH.
6. Forouzan B. A., Gilberg R. F.; "Unix And Shell Programming"; 1st Edition, Australia Thomson Brooks Cole.

Moocs Links and additional reading material:

1. www.nptelvideos.in
2. https://www.udemy.com/
3. https://www.coursera.org/
4. https://swayam.gov.in/

Course Outcomes:

The student will be able to –

1) Illustrate the structure, function, characteristics and performance parameters of a computer system such as benchmarks, Amdahl's law, price and power.
2) Explore the knowledge of Computer Architectures such CISC and RISC
3) Discuss static, dynamic and cache memory in computer system
4) Understand the functions of a contemporary Operating system with respect to convenience, efficiency and the ability to evolve.
5) Apply various CPU scheduling algorithms and process synchronization mechanisms.
6) Identify the mechanisms to deal with Deadlock and primary memory management.

CO PO Map:

CO	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO13	PSO14	PSO15	PSO16
CO1	2	3		2	3											
CO2	2	3												3		
CO3	3		1							3						
CO4	2	2				3					3					
CO5	2		3				3	2			1	3	3			2
CO6		2							2						3	

CO attainment levels:

CO	CO1	CO2	CO3	CO4	CO5	CO6
Level	1	3	2	2	4	5

Future Courses Mapping: Advance Computer Architecture,Advance Operating System, Unix Operating System,Linux programming,Distributed System/Computing,High Performances Computing, Embedded Systems, System Programming, Compiler

Job Mapping: Linux Administration,Kernel Developers,Device Drivers,Application Developers,System programmer

FF No. : 654

IT2252::Data Communication and Networks

Course Prerequisites: Fundamentals of Computer, C/C++ programming

Course Objectives:

1. Understand the importance of Data communication systems and fundamentals.
2. Study different types of signal Systems and flow control Techniques.
3. Solve real-world problems in the context of today's Internet.(TCP/IP and UDP/IP)
4. Distinguish and relate various physical Medias, interfacing standards and adapters.
5. Implement mathematically and logically the working of computer protocols in abstract.

Credits: 5 **Teaching Scheme Theory:** 3 Hours/Week

Tut: 1 Hours/Week

Lab:2 Hours/Week

Course Relevance: A system of interconnected computers and computerized peripherals such as printers is called computer network. This interconnection among computers facilitates information sharing among them by using data communication. The main objective of data communication and networking is to enable seamless exchange of data between any two points in the world.This course will explore common network services and protocols such as email, web servicesetcNetworking is an ever-growing domain in which there is a constant need of support.Networks are becoming progressively more and more convoluted as the technology is advancing and flourishing.

SECTION-1
The importance of Communication, Elements of communication system, Study of Signals: Analog and Digital, Periodic and Aperiodic Signals, Analog Signals, Time and Frequency Domains ,Composite Signals , Digital Signals. Study of Digital transmission: Digital to Digital Conversion, Analog to Digital Conversion. Noise: internal, External, Noise calculation, Nyquist theorem Shannon-Hartley theorem, Numerical based on Shannon-Hartley theorem, Bandwidth calculation. Modulation Techniques: Principles of Amplitude Modulation, Modulation index and percentage of modulation, AM power distribution Single sideband communication, AM transmitters and Receivers. Phase modulation, FM vs. AM, FM vs. PM, AM vs. PM , Introduction to FDM, TDM, WDM, CDMA, Sampling theorem, Modems, Null modems, ASK, PSK, FSK, QPSK. Line coding schemes: Frequency hopping spread spectrum, Direct sequence spread spectrum. Encoding Schemes: NRZ, NRZI, Unipolar, Bipolar, Manchester, Differential Manchester. Introduction to Computer Networking: Uses of Computer Networks, Network Hardware, Network Software Internet Reference Models (OSI and TCP/IP)
SECTION-II

Physical Layer: Basis for Data Communication, Guided Transmission Media, Wireless Transmission Medium, Circuit Switching and Telephone Network, High Speed Digital Access. Data Link Layer: Data Link Layer Design Issues, Error Detection and Correction, Data Link Control and Protocols, Example Data Link Protocol. Medium Access Layer: Channel Allocation Problem, Multiple Access, CSMA, CSMA/CD, CSMA/CA. Local Area Network: Ethernet, Fast Ethernet, Gigabit Ethernet, Wireless LAN, Bluetooth, Connecting devices:- Repeaters, Hub, Bridges, Switch, Router, Gateways. Network Layer: Network Layer Design Issues, Routing Algorithms (Optimality principle, Static Routing Algorithms, Shortest Path, Flooding, Dynamic routing Algorithms, Distance Vector, Link State routing.), Congestion control Algorithms (Principles, Policies, Algorithms),Quality of Service (Requirements, Techniques, Integrated Services & Differentiated Services), Network Layer Protocols (IP Addressing , CIDR & NAT, IP layer protocols (ICMP, ARP, RARP, DHCP, BOOTP), IPv6) Transport layer: Transport Layer Service, Elements of Transport protocols, Internet protocols (UDP and TCP). Application Layer: DNS- Domain Name System, Electronic Mail, World Wide Web, Multimedia (Audio Compression, Streaming Audio, Voice over IP, Video Compression, Video on Demand)

List of Tutorials: (Any Three)

1. Identification of various networks components
2. Establishing LAN
3. Installation of network device drivers
4. Use/installation of proxy server
5. Configuration of network devices in CISCO packet tracer (Windows/Linux)
6. Implement communication between various network devices using CISCO packet tracer (Windows/Linux)
7. Network traffic monitoring using Wireshark/Ethereal (Windows/Linux)

List of Practicals: (Any Six)

1. Write a Program with the following three options to transfer-1. Characters separated by space,2. One Strings at a time,3. One Sentence at a time.
2. Write a program for error detection and correction for 7/8 bits ASCII codes using Hamming Codes or CRC. Demonstrate the packets captured traces using Wireshark Packet Analyzer Tool for peer to peer mode.(50% students will perform Hamming Code and others will perform CRC)
3. Write a program to simulate Go back N and Selective Repeat Modes of Sliding Window Protocol in peer to peer mode
4. Write a program using TCP socket for wired network for following: a. Say Hello to Each other (For all students) b. File transfer (For all students) c. Calculator (Arithmetic) (50% students) d. Calculator (Trigonometry) (50% students)
5. Write a Program with the following three options to transfer-1. Characters separated by

space,2. One Strings at a time,3. One Sentence at a time.

6. Write a program for error detection and correction for 7/8 bits ASCII codes using Hamming Codes or CRC. Demonstrate the packets captured traces using Wireshark Packet Analyzer Tool for peer to peer mode.(50% students will perform Hamming Code and others will perform CRC)
7. Write a program to simulate Go back N and Selective Repeat Modes of Sliding Window Protocol in peer to peer mode
8. Write a program using TCP socket for wired network for following: a. Say Hello to Each other (For all students) b. File transfer (For all students) c. Calculator (Arithmetic) (50% students) d. Calculator (Trigonometry) (50% students)
9. Write a program using UDP Sockets to enable file transfer (Script, Text, Audio and Video one file each) between two machines.
10. Write a program to implement: a. Network Routing: Shortest path routing, AODV. b. Analysis of congestion control (TCP and UDP).
11. Write a program to analyze following packet formats captured through Wireshark for wired networks. 1.Ethernet 2. IP 3.TCP 4. UDP
12. Write a program to prepare TCP and UDP packets using header files and send the packets to the destination machine in peer to peer mode.
13. Configure RIP/OSPF/BGP using Packet Tracer.
14. Use network simulator NS2 to implement: a. Monitoring traffic for the given topology b. Analysis of CSMA and Ethernet protocols.

List of Projects:

1. Write a program using TCP sockets for wired networks to implement a. Peer to Peer Chat b. Multi User Chat Demonstrate the packets captured traces using Wireshark Packet Analyzer Tool for peer to peer mode.
2. Implementation of shortest path protocol
3. Implementation of string encryption and decryption
4. Implementation of character stuffing and destuffing
5. Execution and analysis of Network commands
6. To find out details of network from IP addressing scheme using ‘C’ code
7. Implement real time Internet route optimization.
8. Implement Broadcast Server System.
9. Implement a real time voting System.
10. Real time packet capture and analysis for malwares in wireless networks.

List of Course Seminar Topics:

1. Asynchronous Transfer Mode
2. Need Of Multiplexing for Signal Modulation
3. TDM with PAM a case study
4. Noise signal
5. Basic Network Protocols
6. Manchester Vs Differential Manchester coding technique
7. Amplitude Shift Keying : Working and Applications

8. Nyquist Sampling Theorem
9. CDMA
10. Line coding Techniques with example

List of Course Group Discussion Topics:

1. TCP/IP Model
2. Mobile IP
3. Congestion Control and QoS
4. Wireless Technology for Short range and long range
5. Application Protocols and its security
6. IP Protocols
7. Data Communication Issues in IP Networks and Solutions to it
8. Congestion control in hybrid networks
9. Issues in Real time Audio and video transmission protocol.
10. IPV6

List of Home Assignments:

Design:

1. Enumerate the challenges in Line coding. Draw the line code for the sequence 010011110 using Polar NRZ-L and NRZ-1 schemes.
2.Design the procedure to configure TCP/IP network layer services.
3. Simulation of Routing Protocols using NS2
4. Simulation of FTP based Protocols using CISCO packet Tracer/ NS2
5. Simulation of Congestion Control Protocols Using NS2

Case Study:

1. Amplitude and Frequency Modulation Technique
2. Digital to Analog and Analog to Digital converters
3. Study of Various VPNs
4. IoT Solutions to Current Network Requirement
5. Unix Solutions for Broadcast System

Blog:

1. Communication Protocol
2. Emerging Trends in Computer Networks
3. Use of IOT in Networks
4. Cloud based Network Solutions for real world problems
5. Recent Trends in Computer Security

Surveys:

1.Survey of wireless Technologies
2. Survey of Congestion control methodologies
3. Survey of Bluetooth Technology
4. Survey of Virtual Private Networks
5. Survey of ADHOC Networks

Suggest an assessment Scheme:

1. ESE
2. LAB exam
3. VIVA
4. PPT/GD

Text Books: (As per IEEE format)

1. James F. Kurose, and Keith W. Ross," A Top-Down Approacht," 4th edition, Publisher: Addison-Wesley ISBN: 0-321-49770-8
2. Behrouz A. Forouzan ,"Data Communication and Networking", 4th edition, Tata McGraw Hill
3. Andrew S. Tanenbaum, "Computer Networks" ,5th Edition, Pearson Education

Reference Books: (As per IEEE format)

1. Kurose, Ross,"Computer Networking a Top Down Approach Featuring the Internet", Pearson; 6th edition (March 5, 2012), ISBN-10: 0132856204
2. Holger Karl and Andreas Willig,"Protocols and Architectures for Wireless Sensor Network", Wiley, ISBN: 0-470-09510-5
3. C. Siva Ram Murthy and B. S. Manoj, "Ad Hoc Wireless Networks: Architectures and Protocols", Prentice Hall, 2004

Moocs Links and additional reading material:

1. www.nptelvideos.in
2. https://www.my-mooc.com/en/categorie/computer-networking
3. www.udemy.com

Course Outcomes:

The student will be able to –

1. Understand various modulation techniques in analog, digital carrier system and network architecture, topology and essential components to design computer networks.
2. Implement reliability issues based on error control, flow control and pipelining by using bandwidth, latency, throughput and efficiency.
3. Design mechanisms to demonstrate communication server channel allocation in wired and wireless computer networks
4. Analyze data flow between peer to peer in an IP network using Application, Transport and Network Layer Protocols
5. Demonstrate sustainable engineering practice indicating the scientific purpose and utility of communication frameworks and standards.
6. Develop Client-Server System and prototypes by the means of correct standards, protocols and technology

CO PO Map:

	Program Outcomes												Program Specific Outcomes			
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO13	PSO14	PSO15	PSO16
CO1	3			2	2									3		
CO2	2		3										3			
CO3			3		1			3	3		3				3	
CO4		3												2		
CO5	2					3				3		3				
CO6			3		2		3								3	3

CO attainment levels:

CO	CO1	CO2	CO3	CO4	CO5	CO6
Level	1	3	2	2	4	5

Future Courses Mapping: Network Security and Information System, Internet of Things, Cloud Computing and Security

Job Mapping: Network Engineer, System Engineer (IT and Computer Networking), Software Engineer, Technical Support Engineer, Network Administrator, Information Technology Manager

FF No. : 654

IT2255::Engineering Design

Engineering Design (ED) laboratory course contents are planned to apply software tools and technologies to solve real world problems for benefit of society. Major emphasis is on followingrepresentative domains: Health Care, Agriculture, Defense, Finance, Automation, Education,Security, Renewable Energy, Smart City, Surveillance and etc.

ED Philosophy- This course is planned to motivate the students for Entrepreneurship and industry readiness

Course Outcomes

On completion of the course, learner will be able to–

CO1: Identify the real life problem from societal need point of view

CO2: Choose and compare alternative approaches to select most feasible one

CO3: Analyze and synthesize the identified problem from technological perspective

CO4: Design the reliable and scalable solution to meet challenges

CO5: Evaluate the solution based on the criteria specified

CO6: Inculcate long life learning attitude towards the societal problems

CO PO Map:

	Program Outcomes												Program Specific Outcomes			
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO13	PSO14	PSO15	PSO16
CO1	1	3	3			3								3		
CO2	2			1	2										2	
CO3	3		3		2			3	1				3			
CO4	2	2				3										
CO5	3		3				3		3		3				3	3
CO6	3	2			2					3		3				

FF No. : 654

IT2256::Software Design

For software design (SD) laboratory course, contents are designed to provide an opportunity to students for logic building and development of programming skills to boost employability.

Emphasis is given on problem solving relevant to core subjects from Information Technology like Data Structures, Operating Systems, Cloud Computing, Computer Network and etc. by using only general-purpose programming languages like C, C++ and JAVA. Students can also use development tools relevant to Web Technologies and Android Applications. Execution and Assessment Process:

1. SD would be conducted as a single student activity

2. MSE Review and ESE assessment would be conducted

Course Outcomes:

The student will be able to –

1. Find the real-life problem from societal need point of view

2. Compare different approaches and select the most feasible one.

3. Analyze and synthesize the identified problem from technical viewpoint

4. Design and develop an optimal and reliable solution to meet objectives

5. Validate the solution based on the criteria specified

6. Inculcate long life learning and research attitude among the students

CO PO Map:

	Program Outcomes												Program Specific Outcomes			
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 13	PSO 14	PSO 15	PSO 16
CO1	1	3	3			3								3		
CO2	2			1	2										2	
CO3	3		3		2			3	1				3			
CO4	2	2				3										
CO5	3		3				3		3		3				3	3
CO6	3	2			2					3		3				

IT2253: Software Development Project -I

Course Prerequisites:C, C++, Java, Android and Web Technologies

Course Objectives:

1. To enhance problem solving skills by independent learning
2. To emphasize learning activities that are long-term, interdisciplinary and student-centric.
3. To engage students in rich and authentic learning experiences.
4. To provide every student the opportunity to get involved individually to learn professionalism
5. To inculcate research culture and attitudes towards learning among the students.
6. To improve employability skills of students

Credits: 3 **Teaching Scheme Lab:** 2 Hours/Week

Course Relevance: Software Project Development comes under the category of Project Based Learning (PBL). For better learning experience, along with traditional classroom teaching and laboratory work-based learning, project based learning has been introduced with an objective to motivate students to learn how to solve a problem. Students may work on problems innovatively in different domains like social, technical, cultural and scientific.

Teacher's Role :

- Teacher will act as the facilitator and mentor.
- To utilize the principles of problem solving, critical thinking and metacognitive skills of the students.
- To make the individual aware of time management.
- To Help students to solve technical problems
- To assess and evaluate student performance by monitoring regularly on a weekly basis.

Recommended Guidelines:

SDP is a Project Based Learning. PBL is learning through activity. One of the faculty can be appointed as coordinator for SDP.
Following are the recommended guidelines that will work as an initiator and facilitator in the process of completion of SDP.

1. In the first week of commencement of semester let the coordinator create awareness about SDP (what, why, and how) among the students. Convey students expected outcomes, assessment process and evaluation criteria.
2. Assign mentor batch wise.
3. Provide guidelines for title identification (Problem can be some real-life situation that needs technology solutions. This situation can be identified by meeting people around, visiting various industries, society, and institutes. The solution can be prototype, model, convertible solutions, survey and analysis, simulation, and similar).
4. Let students submit the problem identified in prescribed format (Title, Problem statement, domain, details of a problem undertaken, and what is need of solution to the problem)
5. Coordinator and Mentor can approve the problem statements based on feasibility and learning outcomes expected for second year engineering students.
6. Mentor is to monitor progress of the task during phases of project work. Broadly phases may include- literature survey, requirements gathering, preparing a solution, designing solution, Implementing and testing the solution.
7. Weekly monitoring and continuous assessment record is to be maintained by mentors.
8. Get the IEEE paper format as a report submitted at the end of semester.
9. In semester evaluation will be done by a mentor along with internal faculty as a jury and at the end of semester will be evaluated by industry experts.

Sample Software Project Statement based on Java ,C,C++, Android, Web technologies

1. QR Code bases contactless ordering
2. ATM Simulator
3. Drivers Booking Website
4. Document Scanner app
5. Campus canteen management system
6. movie ticket booking system
7. Covid-19 Live Statistical Analysis

...not limited to.....

Faculty and students are free to include other area which meets the society requirements at large

Course Outcomes:

The student will be able to –

1. Find the real-life problem from societal need point of view

2. Compare different approaches and select the most feasible one.

3. Analyze and synthesize the identified problem from technical viewpoint

4. Design and develop an optimal and reliable solution to meet objectives

5. Validate the solution based on the criteria specified

6. Inculcate long life learning and research attitude among the students

CO PO Map:

CO	Programme Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2				3										
CO2	2			3	1									2		
CO3	3	3							2	3				3		
CO4			3		3		3	3	3		2				3	
CO5		2		2									2			
CO6	3											3				3

CO attainment levels:

CO	CO1	CO2	CO3	CO4	CO5	CO6
Level	4	2	4	5	1	3

Job Mapping: Software Engineer,WebDeveloper,Android Developer

FF No. : 654

IT2254::Engineering Design and Innovation

Course Relevance: Project Centric Learning (PCL) is a powerful tool for students to work in areas of their choice and strengths. Along with course-based projects, curriculum can be enriched with semester long Engineering Design and Development courses, in which students can solve socially relevant problems using various technologies from relevant disciplines. The various socially relevant domains can be like Health care, Agriculture, Defense, Education, Smart City,Smart Energy and Swaccha Bharat Abhiyan. To gain the necessary skills to tackle such projects,students can select relevant online courses and acquire skills from numerous sources under guidance of faculty and enrich their knowledge in the project domain, thereby achieving project centric learning. Modern world sustained and advanced through the successful completion of projects. In short, if students are prepared for success in life, we need to prepare them for a project-based world. It is a style of active learning and inquiry-based learning. Project based learning will also redefine the role of teacher as mentor in the learning process. The PCL model focuses the student on a big open-ended question, challenge, or problem to research and respond to and/or solve. It brings students not only to know, understand and remember rather it takes them to nalyze, design and apply categories of Bloom's Taxonomy.

SECTION-1

Preamble - The content and process mentioned below is the guideline document for the faculties and students to start with. It is not to limit the flexibility of faculty and students;rather they are free to explore their creativity beyond the guideline mentioned herewith. For all courses of ED, laboratory course contents of "Trends in Engineering Technology" are designed as a ladder to extend connectivity of software technologies to solve real world problems using an interdisciplinary approach. The ladder in the form of gradual steps can be seen as below:

Industry Communication Standards, Single Board Computers and IoT, Computational Biology(Biomedical and Bioinformatics), Robotics and Drone, Industry 4.0 (Artificial Intelligence,Human Computer Interfacing, 5G and IoT, Cloud Computing, Big Data and Cyber Securityetc).

Suggest an assessment Scheme:

MSE and ESE

Text Books: (As per IEEE format)

1. A new model of problem-based learning. By Terry Barrett. All Ireland Society for higher education (AISHE).

ISBN:978-0-9935254-6-9; 2017

2. Problem Based Learning. By Mahnazmoallem, woei hung and Nada Dabbagh, Wiley Publishers. 2019.

Stem Project based learning and integrated science, Technology, Engineering and mathematics approach. By

Robert RobartCapraro, Mary Margaret Capraro

Reference Books: (As per IEEE format)

1. De Graaff E, Kolmos A., red.: Management of change: Implementation of problem-based and project-based

learning in engineering. Rotterdam: Sense Publishers. 2007.

2. Project management core textbook, second edition, Indian Edition , by Gopalan.

3. The Art of Agile Development. By James Shore & Shane Warden.

Moocs Links and additional reading material: www.nptelvideos.in

Course Outcomes:

On completion of the course, learner will be able to–

CO1: Identify the real life problem from societal need point of view

CO2: Choose and compare alternative approaches to select most feasible one

CO3: Analyze and synthesize the identified problem from technological perspective

CO4: Design the reliable and scalable solution to meet challenges

CO5: Evaluate the solution based on the criteria specified

CO6: Inculcate long life learning attitude towards the societal problems

CO-PO Map:

	Program Outcomes												Program Specific Outcomes			
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 13	PSO 14	PSO 15	PSO 16
CO1	1	3	3			3								3		

CO2	2			1	2									2	
CO3	3		3		2			3	1				3			
CO4	2	2				3										
CO5	3		3				3		3		3				3	3
CO6	3	2			2					3		3				

B.Tech. Information Technology(applicable w.e.f. AY 20-21)

TY IT Module -V (C20 Pattern)

Subject head	Course code	Course name	Contact hours per week			Credits
			Theory	Lab	Tut	
S1	IT3201	Artificial Intelligence	3	2	1	5
S2	IT3202	System Programming	3	2	1	5
S3	IT3203	Image Processing and Computer Vision	3	2	1	5
S4	IT3204	Design and Analysis of Algorithms	3	2	0	4
S5	IT3205	Engineering Design And Innovation – III	-	-	-	4
S6	IT3206	Engineering Design-I	-	2	-	1
		Total	**12**	**10**	**3**	**24**

B.Tech. Information Technology (applicable w.e.f. AY 20-21)

TY IT Module -VI (C20 Pattern)

Subject head	Course code	Course name	Contact hours per week			Credits
			Theory	Lab	Tut	
S1	IT3207	Web Technology and cloud computing	3	2	1	5
S2	IT3208	Object Oriented and Problem solving	3	2	1	5
S3	IT3209	Software Design and Methodologies	3	2	1	5
S4	IT3210	Internet of Things	3	2	0	4
S5	IT3211	Engineering Design And Innovation – IV	-	-	-	4

		Total	**12**	**8**	**3**	**23**

FF No. : 654

IT3201::Artificial Intelligence

Course Prerequisites: Data structures, Computer programming

Course Objectives:

To make students

1. Familiar with basic principles of AI
2. Capable of using heuristic searches
3. Aware of knowledgebased systems
4. Able to use fuzzy logic and neural networks
5. Learn various applications domains AI

Credits: 5 **Teaching Scheme Theory:** 3Hours/Week

Tut: 1 Hours/Week

Lab:2Hours/Week

Course Relevance: This course is highly applied in many scientific and engineering disciplines

SECTION-1

Fundamentals of Artificial Intelligence

Introduction, A.I. Representation, Non-AI &AI Techniques, Representation of Knowledge, Knowledge Base Systems, State Space Search, Production Systems, Problem Characteristics, types of production systems, Intelligent Agents and Environments, concept of rationality, the nature of environments, structure of agents, problem solving agents, problem formulation

Uninformed Search Strategies

Formulation of real world problems, Breadth First Search, Depth First Search, Depth Limited Search, Iterative Deepening Depth First Search, Bidirectional Search, Comparison of Uninformed search Strategies, Searching with partial information, Sensor-less problems, Contingency problems.

Informed Search Strategies

Generate& test, Hill Climbing, Best First Search, A* and AO* Algorithm, Constraint

satisfaction, Game playing: Minimax Search, Alpha-Beta Cutoffs, Waiting for Quiescence

SECTION-1I

Knowledge Representation

Knowledge based agents, Wumpus world. Propositional Logic: Representation, Inference, Reasoning Patterns, Resolution, Forward and Backward Chaining.First order Logic: Representation, Inference, Reasoning Patterns, Resolution, Forward and Backward Chaining. Basics of PROLOG: Representation, Structure, Backtracking. Expert System: Case study of Expert System in PROLOG

Introduction to Planning and ANN

Blocks world, STRIPS, Implementation using goal stack, Introduction to Neural networks:basic, comparison of human brain and machine, biological neuron, general neuron model, activation functions, Perceptron learning rule, applications and advantages of neural networks. Brief introduction to single layer and multiplayer networks.

Uncertainty

Non Monotonic Reasoning, Logics for Non Monotonic Reasoning, Justification based Truth Maintenance Systems, Semantic Nets, Statistical Reasoning, Fuzzy logic: fuzzy set definition and types, membership function, designing a fuzzy set for a given application. Probability and Bayes' theorem, Bayesian Networks.

List of Tutorials: (Any Three)

1) Heuristic function design for Tic-Tac-Toe
2) Heuristic function design for 8-puzzle / or given problem
3) Trace of A* algorithm for 8-puzzle
4) Trace of AO* algorithm for a given problem
5) Conversion to clause form
6) Resolution in predicate logic
7) Resolution in propositional logic
8) Using inference rules in predicate logic
9) Design of fuzzy sets for a given application
10) Perceptron learning for 2 class classification

List of Practicals: (Any Six)

1. Implement Non-AI and AI Techniques
2. Implement any one Technique from the following:

a. Best First Search & A* algorithm
b. AO* algorithm
c. Hill Climbing

3. Implement Perceptron learning algorithm
4. Implement a real life application in Prolog.
5. Expert System in Prolog-new application
6. Implement any two Player game using min-max search algorithm.
7. Design a fuzzy set for shape matching of handwritten character
8. Conducting Turing test of an online chat robot

List of Projects: (Any project within following domain)

1. Pattern recognition –Classification, Clustering, hybrid-classification clustering
2. Prediction using -Regression –Linear or nonlinear
3. Game playing- single player/2-player/multi-player
4. Use of Knowledge based system for generating inferences
5. Deep Learning
6. Neural network training and using for a real application
7. Use of fuzzy sets for human like reasoning
8. Use of any ML algorithm for solving real world problem

List of Course Seminar Topics:

1. Fuzzy sets theory- Operations on sets
2. Deep Learning
3. Non-monotonic Logic and real applications
4. Neural network training for real applications
5. Predicate Logic for reasoning
6. Expert system design and development
7. PROLOG and LISP comparison
8. Heuristic Search Techniques
9. Game playing - A specific game and its method
10. ML Algorithms for predications

List of Course Group Discussion Topics:

1. Semantic Networks
2. Fuzzy set design for real application
3. Neural network training and testing
4. Classification, Clustering and hybrid approaches to pattern recognition
5. Blocks world Domain- STRIPS
6. Predicate logic inference rules
7. Resolution in predicate logic
8. Perceptron Learning rule
9. R-category perceptron learning algorithm and application design
10. Bays theorem and classifier

List of Home Assignments:

Design:

1. Heuristic function design for a specific search application
2. Knowledge base design for a small expert system for real application
3. Design of fuzzy sets for a given application
4. Designing Neural network architecture for pattern recognition
5. Design of a reasoning system for the shape matching of objects
6. Any other topic mutually decided by students-instructor

Case Study:

1. PROLOG expert system
2. Alexa
3. Google Assistant
4. Page ranking algorithm
5. Emotion detection
6. Any other topic mutually decided by students-instructor

Blog:

1. Future of AI
2. Deep Learning Architectures
3. AI in healthcare
4. AI in finance
5. Neural network classification
6. Any other topic mutually decided by students-instructor

Surveys:

1. HCR algorithms
2. Face recognition
3. Thumb print recognition
4. Image captioning

5. Data sampling techniques
6. Any other topic mutually decided by students-instructor

Suggest an assessment Scheme:

1.MSE-10
2.PPT-10
3.ESE-10
4.GD-10
5.VIVA-20
6.Lab Assignment and Course Project -40

Text Books: ***(As per IEEE format)***

1. Elaine Rich and Kevin Knight,“ Artificial Intelligence”, 2nd Ed., Tata McGraw Hill, 1991
2. Stuart Russell & Peter Norvig, “Artificial Intelligence : A Modern Approach”, 2nd Ed, Pearson Education, 2003

Reference Books: ***(As per IEEE format)***

1. Ivan Bratko, “Prolog Programming For Artificial Intelligence”, 2nd Ed. Addison Wesley, 1986.
2. Eugene, Charniak, Drew Mcdermott, “Introduction to Artificial Intelligence”, Addison Wesley, 1985
3. Dan W Patterson, “Introduction to AI and Expert Systems”, PHI, 1990
4. Nils J. Nilsson, “Principles of Artificial Intelligence”, 1st Ed., Morgan Kaufmann,1982
5. Carl Townsend, “Introduction to turbo Prolog”, Paperback, 1987
6. Jacek M. Zurada, “Introduction to artificial neural systems”, Jaico Publication, 1994

Moocs Links and additional reading material:

1.http://www.eecs.qmul.ac.uk/~mmh/AINotes/AINotes4.pdf

2.https://www.slideshare.net/JismyKJose/conceptual-dependency-70129647

3.https://web.archive.org/web/20150813153834/http://www.cs.berkeley.edu/~zadeh/papers/Fuzzy%20Sets-Information%20and%20Control-1965.pdf

4.https://www.youtube.com/watch?v=aircAruvnKk

5.https://www.youtube.com/watch?v=IHZwWFHWa-w

6. Others suggested by instructor

Course Outcomes:

Upon completion of the course, graduates will be able to -

1. Understand the basics of the theory and practice of Artificial Intelligence as a discipline and about intelligent agents capable of problem formulation.

2. Evaluation of different uninformed search algorithms on well formulate problems along with stating valid conclusions that the evaluation supports.

3. Design and Analysis of informed search algorithms on well formulated problems.

4. Formulate and solve given problem using Propositional and First order logic.

5. Apply planning and neural network learning for solving AI problems

6. Apply reasoning for non-monotonic AI problems.

CO PO Map:

CO	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 13	PSO 14	PSO 15	PSO 16
CO1	3	3														
CO2	3		2	2	3											
CO3	3		3			2	3	3	3		3				2	
CO4	2	3		3										3		
CO5	3								2	3		2	3			3
CO6	3					3				3		3				3

CO attainment levels:

CO	CO1	CO2	CO3	CO4	CO5	CO6
Level	2	3	3	4	5	3

Future Courses Mapping: Fyzzy Logic and soft computing, Artificial Neural networks, Pattern Recognition, Knowledge based systems, Intelligent Searching, Natural Language Processing and etc.

Job Mapping: Knowledge Engineer in Expert system, AI Engineer, Developer -AI applications, Architect AI solutions and etc

FF No. : 654

IT3202::System Programming

Course Prerequisites: Data structures, programming in C/C++/Java

Course Objectives:

1.To introduce students the concepts and principles of system programming and to enable them to understand the duties and scope of a system programmer.

2.To provide students the knowledge about both theoretical and practical aspects of system programming, teaching them the methods and techniques for designing and implementing system-level programs.

3.To train students in developing skills for writing system software with the aid of sophisticated OS services, programming languages and utility tools.

4.To train students in developing skills for writing compiler from scratch

5.To understand encoding-decoding of instruction set for a new machine.

Credits: 5 **Teaching Scheme Theory:** 3Hours/Week

Tut: 1 Hours/Week

Lab:2 Hours/Week

Course Relevance: This course is helpful in designing different system softwares like operating systems, compilers and device drivers etc.

SECTION-1

Introduction: software types, software hierarchy, components of system software, machine structure, interfaces, address space, levels of system software, recent trends in software development.

Language processors: Programming languages and language processors, fundamentals of language processing, life cycle of a source program, language processing activities, data structures for language processing: search data structures, allocation data structures.

Macroprocessor: Introduction, macro definition and call, macro expansion, nested macro calls, design of macro processor, design issues of macro processors, two-pass macro processors, one-pass macro processors. Assembler: Elements of assembly language programming, design of the assembler, assembler design criteria, types of assemblers, two-pass assemblers, one-pass assemblers, assembler algorithms, multi-pass assemblers, variants of assemblers design of two pass assembler, machine dependent and machine independent assembler features. Allocation, relocation, linker v/s loader.

Linkers and Loaders: relocation and linking concepts, static and dynamic linker, subroutine linkages, Linking of Overlay Structured Programs, dynamic linking libraries, MSDOS linker. Loaders: Introduction to Loader, Sequential and Direct Loaders, loader Schemes compile and go loader, general loader scheme, absolute loader, relocating loader, dynamic linking loader.

SECTION-II

Systems Programming for Linux as Open Source OS: Essential concepts of linux system programming, APIs and ABIs, standards, program segments/sections, the elf format, linking and loading, linux dynamic libraries (shared objects), dynamic linking,API compatibility, dynamically linked libraries.

Advanced system programming concepts: Operating system interfaces, stack smashing. Multitasking and paging, address translation, memory protection, comparison with windows.

Compilers: Introduction to Compiler phases, Introduction to cross compiler, Features of machine dependent and independent compilers, types of compilers.

Interpreters: Compiler Vs. Interpreter, phases and working. Debuggers: Types of errors, debugging procedures, classification of debuggers, dynamic/interactive Debugger. Lexical Analyzer, Specification and Recognition of Tokens, LEX, Expressing Syntax, Top-Down Parsing, Predictive Parsers. Bottom-Up Parsing, LR Parsers: constructing SLR parsing tables, constructing Canonical LR parsing tables, Constructing LALR parsing tables, using ambiguous grammars, YACC. Encoding and decoding schemes for the X-86 processor. Device Driver: Types of drivers, driver history, driver issues, kernel level device drivers, virtual device drivers(VxD), device driver stack buses and physical devices, static device drivers, dynamic device drivers, PnP, device namespace, and named devices.TSR: types, structure, details of TSR loading, examples, writing TSRs.

List of Tutorials: (Any Three)

1) File handling basics
2) Debugging concepts
3) logic development for implementing assignments
4) Booting process and system files
5) Inbuilt drivers structure of Linux

6) Study of Linkers
7) Study of Loaders

8) Different DLL
9) Paging
10) Segmentation

List of Practicals: (Any Six)

1)Design and implementation of an Editor: Design of a Line or Screen Editor using C Language.
2) Simulation of linkers.
3) Simulation of loaders.
4) Understanding the design for DLL on Linux shared library.
5) Use of different debugger tools.
6) Printer controller in device drivers.
7) Write a TSR program in 8086 ALP to implement Real Time Clock (RTC). Read the Real Time from CMOS chip by suitable INT and FUNCTION and display the RTC at the bottom right corner on the screen. Access the video RAM directly in your routine.
8)Write a TSR program in 8086 ALP to implement Screen Saver. Screen Saver should get activated if the keyboard is idle for 7 seconds. Access the video RAM directly in your routine.
9) Write a TSR program in 8086 ALP to handle the "Divide by zero" interrupt. Test your program with a small code, which causes the divide by zero interrupt.
10) Write a TSR program in 'C' that would change the color of the screen every 10 seconds.

List of Projects:

1. Design Macroprocessor
2. Design One pass Assembler
3. Design Two pass Assembler
4. Design direct linking loader
5. Mouse driver for Linux
6. USB driver for Linux
7. Keyboard driver for Linux
8. Implement a Lexical Analyzer using LEX for a subset of C.
9. Design and implementation of DLL on Linux shared library
10. Design a device driver on Linux system

List of Course Seminar Topics:

1. Macro processor design
2. Assembler design
3. machine dependent and machine independent assembler features

4. linker v/s loader
5. Structured Programs
6. MSDOS linker
7. dynamic linking loader.
8. dynamic linking libraries
9. static and dynamic linker with subroutine linkages
10. Linux linking schemes

List of Course Group Discussion Topics:

1. Windows Vs Linux OS
2. Application Programming Vs System Programming
3. Carrers in Application Programming Vs System Programming
4. API Vs ABI
5. Single pass Vs multipass strategy
6. Compiler Vs Interpret

List of Home Assignments:

Design:

1. Design and implementation of 2 Pass Macroprocessor.
2. Design and implementation of 2 Pass Assembler.
3. Simulation of linker & loader.
4. Implement a Lexical Analyzer using LEX for a subset of C.
5. Design and implementation of DLL on Linux shared library.
6. Design a device driver on Linux system.

Case Study:

1. Linux OS system architecture
2. Windows OS system architecture
3. Android OS system architecture
4. MAC OS system architecture
5. New trends in linker and loaders

Blog:

1. PASS-I Assembler
2. PASS-II Assembler
3. Macro expansion Algorithm
4. Macro Definition Algorithm
5. Machine Language Instruction Generation from Assembly Language Instruction
6. Language Processor Pass
7. Procedure vs Problem Oriented Languages
8. Macro Expansion and Macro definition
9. Linux File System

10. Device Drivers
11. Dynamic Link Library
12. BIOS
13. DOS
14. LINKER
15. LOADER

Surveys:

1. Display drivers
2. Network drivers
3. Printer drivers
4. New trends in device drivers design
5. Driver adaptability

Suggest an assessment Scheme:

1. Home Assignment
2. MSE & ESE
3. Quiz
4. Seminar
5. Group Discussion
6. LAB-Course Assignment and Project Evaluation

Text Books: ***(As per IEEE format)***

1. D M Dhamdhere,"Systems Programming & Operating Systems", Tata McGraw Hill Publications, ISBN – 0074635794

2. John J Donovan, "Systems Programming", ISBN - 0070176035

Reference Books: ***(As per IEEE format)***

1. Robert Love,"Linux System Programming",O'Reilly, ISBN 978-0-596-00958-8

Moocs Links and additional reading material:

1. www.nptelvideos.in

Course Outcomes:
The student will be able to –

1. Discriminate among different System software and their functionalities.

2. Design language translators like Macroprocessor and Assembler.

3. Develop approaches and methods for implementing linker and loader.

4. Identify and interpret the different phases of a compiler and their functioning.

5. Design a well-structured system to ensure the syntactic and semantic correctness

of a program.

6. Interpret the methods and techniques about instructions Encoding and Decoding for implementing system-level programs and Device Drivers.

CO PO Map:

CO	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO13	PSO14	PSO15	PSO16
CO1	2	3								1						
CO2	3		3		3				3	3	3				2	
CO3	3		3			3		2								3
CO4	3	2		3												
CO5	1		3				3	3	3	3	3	3			3	
CO6	2				2								3	3		

CO attainment level:

CO	CO1	CO2	CO3	CO4	CO5	CO6
Level	1	2	3	4	5	2

Future Courses Mapping: Linux system programming

Job Mapping: System Programming,System Engineer, Opportunities in companies like Nvidia

FF No. : 654

IT3203::Image Processing and Computer Vision

Course Prerequisites: Knowledge of Linear Algebra, Different types of Signals

Course Objectives:

1. To learn Image Processing fundamentals.
2. To study Image preprocessing methods.
3. To understand image lossless and lossy compression techniques.
4. To introduce the major ideas, methods, and techniques of computer vision and pattern recognition.
5. To acquaint with Image segmentation and shape representation.
6. To explore object recognition and its application

Credits: 5 **Teaching Scheme Theory:** 3 Hours/Week

Tut: 1 Hours/Week

Lab: 2 Hours/Week

Course Relevance: Image processing and computer vision are of fundamental importance to any field in which images must be enhanced, manipulated, and analyzed. They play a key role in remote sensing, medical imaging, inspection, surveillance, autonomous vehicle guidance, and more. Students of this course will benefit from the direct visual realization of mathematical abstractions and concepts, and learn how to implement efficient algorithms to perform these tasks.

SECTION-1
Introduction: Elements of image processing system, Scenes and Images, Vector Algebra, Human Visual System, color vision color model: RGB, HVS, YUV, CMYK, YC_bC_r. Spatial domain techniques { Image Negative, Contrast stretching, gray level slicing, bit plane slicing, histogram and histogram equalization, local enhancement technique, image subtraction and image average. Image Statistical and Geometrical properties. **Image Smoothening**: low-pass spatial filters, median filtering. **Image Sharpening:** high-pass spatial filter, derivative filter. **Introduction to Image compression and its need:** Coding redundancy, classification of compression techniques (Lossy and lossless- JPEG, RLE, Huffman). One-two dimensional Discrete Fourier Transform (DFT). Cosine, affine transforms. Sub band coding, multi resolution expansions, Wavelet Transform in one dimensions; Wavelet transforms in two dimensions. Applications of transforms in Image processing.
SECTION-1I

Shape Representation and Segmentation : Classification of Image segmentation techniques: Edge Based approaches to segmentation, Gradient using Masks, LOG,DOG, Canny, Edge Linking, Line detectors (Hough Transform), Corners – Harris, Region Growing, Region Splitting. Medial representations, Multiresolution analysis. **Object recognition**: Object Recognition {Need, Automated object recognition system, pattern and pattern class, relationship between image processing and object recognition, approaches to object recognition. Hough transforms and other simple object recognition, methods, Shape correspondence and shape matching, Principal component analysis , Singular Value Decomposition Shape priors for recognition. **Image Understanding** : Pattern recognition methods, HMM, GMM and EM. **Applications**: Photo album – Face detection – Face recognition, Object tracking etc

List of Tutorials: (Any Three)

1) Implement Image preprocessing and Edge detection
2) Implement camera calibration methods
3) Determine depth map from Stereo pair
4) Implement Segmentation methods
5) Image Compression
6) Construct 3D model from defocus image
7) Construct 3D model from Images
8) Implement object detection and tracking from video
9) Face detection and Recognition
10) Object detection from dynamic Background for Surveillance
11) Content based video retrieval
12) Construct 3D model from single image

List of Practicals: (Any Six)

1) A. Write matlab code to display following binary images
   Square, Triangle, Circle
   B. Write matlab code to perform following operations on images
   Flip Image along horizontal and vertical direction, Enhance quality of a given image by changing brightness of image, Image negation operation, Change contrast of a given Image.
2) A. Write Matlab code to implement pseudo colouring operation of a given image using Intensity
   B. Write Matlab Code for Pseudo Colour of Image by using Gray to colour transform.
3) Study of different file formats e.g. BMP, TIFF and extraction of attributes ofBMP.
4) Write matlab code to find following statistical properties of an image- Mean, Median, Variance, Standard deviation, Covariance.
5) Write matlab code to enhance image quality by using following techniques-Logarithmic transformation, Histogram Equalization, Gray level slicing with and without background, Inverse transformation.

6) Read an Image and Perform singular value decomposition. Retain only k largest Singular values and reconstruct the image. Also Compute the Compression ratio
7) Write matlab code to enhance image quality by using following techniques-Low pass and weighted low pass filter, Median filter, Laplacian mask.
8) Write matlab code for edge detection using Sobel, Prewitt and Roberts operators.
9) Write C-language code to find out Huffman code for the following word - COMMITTEE.
10) Write matlab code to design encoder and decoder by using Arithmetic coding for the following word MUMMY. (Probabilities of symbols M-0.4, U-0.2, X-0.3,Y- 0.1).
11) Write matlab code to find out Fourier spectrum, phase angle and power spectrum of binary image and gray scale image.
12) Develop an algorithm for pre-processing of an input image for geometric transformation of image.
13) Develop an algorithm for pre-processing of an input image for enhancement of image.
14) Develop an algorithm for feature extraction of an input image using point detector
15) Develop an algorithm for segmentation of an input image
16) Develop an algorithm for recognition of an object from input image
17) Develop an algorithm for motion estimation from a given video sequence.
18) Design an algorithm for SVM classifier
19) Design an algorithm for adaboost classifier
20) Line detection using Hough transform
21) To design and develop optical flow algorithm for Motion Estimation

List of Projects:

1. Lossless and Lossy Compression Techniques
2. Pseudo Colour Image Processing Model
3. Image and Video Enhancement models
4. Human Motion Detection
5. Object Detection Model
6. Face Recognition Model
7. Dynamic Texture Synthesis
8. Image and Video Editing
9. Develop an application for a vision-based security system during day/night time. The system should trigger an audio- visual alarm upon unauthorized entry.
10. Develop motion estimation/ tracking system to recognize object of interest related to one of the following applications. (Automobile tracking/ face tracking/ human tracking).
11. Develop motion estimation/ tracking system to recognize object of interest related to one of the following applications. (Space vehicle tracking/ solar energy tracking/ crowd pattern tracking).

List of Course Seminar Topics:

1. Linear Algebra used for Image Processing
2. Image File format-TIFF
3. Color Model
4. Pseudo Colour Image Processing

5. Image Enhancement-Spatial Domain
6. Image Smoothening
7. Image Enhancement-Frequency Domain
8. Image Sharpening
9. Image Segmentation
10. Watershed Transformation
11. 3-D model
12. Face Detection
13. Object Recognition

List of Course Group Discussion Topics:

1. Lossy Compression Techniques
2. Loss less Compression Techniques
3. Fourier Transform
4. Set Partitioning in Hierarchical Trees-SPIHT Wavelet Transform
5. Image Understanding-Pattern Recognition Models
6. Object Recognitions
7. 3-D models and its applications
8. Wavelet Transform
9. Face detection models etc.

List of Home Assignments:

Design:

1. Human Motion Detection
2. Object Detection Model
3. Face Recognition Model
4. Dynamic Texture Synthesis
5. Image and Video Editing
6. Design 3-D models
7. Face Detection Models
8. Develop an application for a vision-based security system during day/night time. The system should trigger an audio- visual alarm upon unauthorized entry.
9. Develop motion estimation/ tracking system to recognize object of interest related to one of the following applications. (Automobile tracking/ face tracking/ human tracking).
10. Develop motion estimation/ tracking system to recognize object of interest related to one of the following applications. (Space vehicle tracking/ solar energy tracking/ crowd pattern tracking).

Case Study:

1.Image Processing for Smart City
2.Computer Vision for AR AVR
3.Research Areas in Image Processing & Computer Vision
4.Image Processing for Swastha Bharat

5.Image Processing in IoT
6.Computer Vision in Health Analytics
7.Computer Vision in wearable computing

Blog:

1. Computer Vision for Data Science
2. Image Processing for Smart Agriculture
3. Image Processing in Medical Field
4. Usage of AI for Computer Vision
5. Job Opportunities in Image Processing and Computer Vision
6. Usage of Image Processing in Computer Vision, Machine Learning, Deep Learning, and AI

Surveys:

1.Steganography and Cryptography
2.Image Processing for Educations
3.Dynamic Texture Synthesis
4.Classifications and Recognitions
5.Image & Video Compression
6.Drone based Surveillance
7.Video Editing
8.Human Motion/Object tracking and detections
9.Image Processing using High-Performance Computing-Computational
10.Complexity/Time Complexity and Execution time
11.Recent Trends in Image and Video Processing

Suggest an assessment Scheme:

1. MSE
2. ESE
3. LAB+Course Project
4. GD
5. PPT
6. VIVA

Text Books: ***(As per IEEE format)***

1. Rafael Gonzalez & Richard Woods, "Digital Image Processing," 3rd Edition, Pearson publications, ISBN 0132345633.
2. S. Jayaraman, S Esakkirajan, & T Veerakumar, "Digital Image Processing," Tata McGraw Hill Education, ISBN(13) 9780070144798.
3. Anil K. Jain, "Fundamentals of Digital Image Processing," 5th Edition, PHI publication, ISBN 13: 9780133361650.
4. Richard Szeliski, "Computer Vision: Algorithms and Applications (CVAA)", Springer, 2010.
5. E. R. Davies, "Computer & Machine Vision," 4thEdition, Academic Press, 2012.
6. Simon J. D. Prince, "Computer Vision: Models, Learning, and Inference", Cambridge

University Press, 2012.

Reference Books: ***(As per IEEE format)***

1. Pratt, "Digital Image Processing," Wiley Publication, 3rd Edition, ISBN 0-471-37407-5.
2. K.R. Castleman, "Digital Image Processing," 3rd Edition, Prentice Hall: Upper Saddle River, NJ, 3, ISBN 0-13-211467 -4.
3. K. D. Soman and K. I. Ramchandran, "Insight into wavelets - From theory to practice," 2nd Edition PHI, 2005.
4. D. Forsyth and J. Ponce, "Computer Vision - A modern approach," Prentice Hall
5. E. Trucco and A. Verri, "Introductory Techniques for 3D Computer Vision," Publisher: Prentice Hall.
6. D. H. Ballard, C. M. Brown,"Computer Vision", Prentice-Hall, Englewood Cliffs, 1982.

Moocs Links and additional reading material:www.nptelvideos.in

Course Outcomes:
The student will be able to-

1. Apply lossless and Lossy compression techniques for image compression.
2. Explore pre-processing algorithms to acquire images.
3. Use various image transforms to analyze and modify images.
4. Extract features from Images and do analysis of Images.
5. Apply Supervised and Unsupervised Machine Learning for Image Classification.
6. Make use of Computer Vision algorithms to solve real-world problems.

CO PO Map:

	Program Outcomes												Program Specific Outcomes			
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 13	PSO 14	PSO 15	PSO 16
CO1	3				2								3			
CO2			3						3		3				1	
CO3	2	2				3								3		

CO4		3								3					3	
CO5	2				2											
CO6				3		2	3	2				3			3	3

CO attainment levels:

CO	CO1	CO2	CO3	CO4	CO5	CO6
Level	2	3	2	3	4	5

Future Courses Mapping:AR VR, NLP, AI, ML, Video Analytics using GPU

Job Mapping: Image Processing Developer, Machine Vision Engineer, Associate Data Scientist Computer Vision, Data Scientist Image Processing,Computer Vision, Lead Scientist - Image Analytics & Signal Processing, Software Development Engineer - Image Processing, Image Processing & Computer Vision Engineer,Medical Image Processing Engineer, Architect - Video and Image Processing, Lead - Medical Image Analysis Developer, Research Engineer - Image Processing, Image Analysis Scientist - Image Processing/Pattern Recognition.

FF No. : 654

IT3204::Design and Analysis of Algorithms

Course Prerequisites: Basic course on programming, Data structures, Discrete structures

Course Objectives:

1. Formulate a given computational problem in an abstract and mathematically precise manner.

2. Choose a suitable paradigm to design an algorithm for given computational problems.

3.Understand asymptotic notations and apply suitable mathematical techniques to find asymptotic time and space complexities of algorithms.

4.Understand notions of NP-hardness and NP-completeness and their relationship with the intractability of decision problems.

5. Apply randomized, approximation algorithms for given computational problems.

Credits: 4 **Teaching Scheme Theory:** 3 Hours/Week

Lab:2 Hours/Week

Course Relevance: This is an important course for Information Technology Engineering. It develops algorithmic thinking capability of students. Designing algorithms using suitable paradigms and analysing the algorithms for computational problems has a high relevance in all domains of IT (equally in Industry as well as research). Once the student gains expertise in Algorithm design and in general gains the ability of Algorithmic thinking, it facilitates in systematic study of any other domain (in IT or otherwise) which demands logical thinking. This course is also relevant for students who want to pursue research careers in theory of computing, computational complexity theory, advanced algorithmic research.

SECTION-1

Basic introduction to time and space complexity analysis: Asymptotic notations (Big Oh, small oh, Big Omega, Theta notations). Best case, average case, and worst-case time and space complexity of algorithms. Overview of searching, sorting algorithms. Adversary lower bounds (for the comparison-based sorting algorithms, for finding second minima). Using Recurrence relations and Mathematical Induction to get asymptotic bounds on time complexity. Master's theorem and applications. Proving correctness of algorithms.

Divide and Conquer: General strategy**,** Binary search and applications, Analyzing Quick sort, Merge sort, Counting Inversions, Finding a majority element, Order statistics (randomized and deterministic algorithms), Josephus problem using recurrence, Efficient algorithms for Integer arithmetic (Euclid's algorithm, Karatsuba's algorithm for integer multiplication, fast exponentiation).

Dynamic Programming: General strategy, simple dynamic programming based algorithms to compute Fibonacci numbers, binomial coefficients, Matrix Chain multiplication, Optimal binary search tree (OBST) construction, Coin change problem, 0-1 Knapsack, Traveling Salesperson Problem, All pair shortest path algorithm, Longest increasing subsequence problem, Largest independent set for trees.

SECTION-1I

Greedy strategy: General strategy, Analysis and correctness proof of minimum spanning tree and shortest path algorithms, fractional knapsack problem, Huffman coding, conflict free scheduling.

Backtracking strategy: General strategy, n-queen problem, backtracking strategy for some NP-complete problems (e.g. graph coloring, subset sum problem, SUDOKU)

Branch and Bound strategy:LIFO Search and FIFO search, Assignment problem

Introduction to complexity classes and NP-completeness: Complexity classes P, NP, coNP, and their interrelation, Notion of polynomial time many one reductions reduction, Notion of NP-hardness and NP-completeness, Cook-Levin theorem and implication to P versus NP question, NP-hardness of halting problem. NP-Complete problems (some selected examples), reducing NP problems to Integer Linear Programming.

Introduction to Randomized and Approximation algorithms: Introduction to randomness in computation, Las-Vegas and Monte-Carlo algorithms, Abundance of witnesses/solutions and application of randomization, solving SAT for formulas with "many" satisfying assignments, randomized quick sort, majority search, Karger's Min-cut algorithm, coupon collector problem, randomized data structures (randomized BST, skip lists)

Introduction to Approximation algorithms for NP-optimization problems, Vertex Cover, metric Traveling-Sales-Person Problem (metric-TSP), Hardness of approximation for TSP.

List of Practicals: (Any Six)

1) Assignment based on some simple coding problems on numbers, graphs, matrices
2) Assignment based on analysis of quick sort (deterministic and randomized variant)
3) Assignment based on Divide and Conquer strategy (e.g. majority element search, finding kth rank element in an array)
4)Assignment based on Divide and Conquer strategy (e.g. efficient algorithm for Josephus problem using recurrence relations, fast modular exponentiation)
5) Assignment based on Dynamic Programming strategy (e.g. Matrix chain multiplication, Longest increasing subsequence)
6) Assignment based on Dynamic Programming strategy (e,g, All pair shortest path, Traveling Sales Person problem)

7) Assignment based on Greedy strategy (e.g. Huffman encoding)
8) Assignment based on Backtracking (e.g. graph coloring, n-queen problem)
9) Assignment based on Las-Vegas and Monte-Carlo algorithm for majority element search
10) Assignment based on factor-2 approximation algorithm for metric-TSP

List of Projects:

1. Applications of A* algorithm in gaming
2. Pac-Man game
3. Creation / Solution of Maze (comparing the backtracking based solution and Dijkstra's algorithm)
4. Different exact and approximation algorithms for Travelling-Sales-Person Problem
5. Knight tour algorithms
6. Network flow optimization and maximum matching
7. AI for different games such as minesweeper, shooting games, Hex, connect-4, sokoban, etc
8. SUDOKU solver
9. Algorithms for factoring large integers
10. Randomized algorithms for primality testing (Miller-Rabin, Solovay-Strassen)
11. Slider puzzle game

List of Course Seminar Topics:

1. Complexity classes
2. Space complexity
3. Divide and Conquer Vs Dynamic Programming
4. Greedy strategy Vs Backtracking strategy
5. Dynamic Programming Vs Greedy
6. Computational Complexity
7. Comparison of P Vs NP problems
8. Compression Techniques
9. Approximation algorithms
10. Pseudorandom number generators

List of Course Group Discussion Topics:

1. Greedy Algorithms Vs. Dynamic Programming strategy
2. Dynamic Programming Vs Greedy
3. NP-completeness
4. P Vs NP problems
5. Paradigms for algorithm design
6. Different Searching techniques
7. Relevance of Cook-Levin theorem
8. Randomness in computation
9. Approximation Algorithms
10. Application of Recursion

List of Home Assignments:

Design:

1. Divide and Conquer strategy for real world problem solving
2. Dynamic Programming strategy for real world problem solving
3. Problems on Randomized Algorithms
4. Problems on Approximation Algorithms
5. Problems on NP completeness

Case Study:

1. Encoding techniques
2. Network flow optimization algorithms
3. Approximation algorithms for TSP
4. Sorting techniques
5. AKS primality test

Blog:

1. How to decide suitability of Approximation Algorithms
2. When do Randomized Algorithms perform best
3. Applications of Computational Geometry Algorithms
4. Role of number-theoretic algorithms in cryptography
5. Performance analysis of Graph Theoretic Algorithms

Surveys:

1. Primality Testing Algorithms
2. Integer Factoring Algorithms
3. Shortest Path Algorithms
4. Algorithms for finding Minimum Weight Spanning Tree
5. SAT solvers

Suggest an assessment Scheme:

1. Home Assignment
2. MSE & ESE
3. Quiz
4. Seminar
5. Group Discussion
6. LAB-Course Assignment and Project Evaluation

Text Books: (As per IEEE format)

1. Cormen, Leiserson, Rivest and Stein "Introduction to Algorithms", 3rd edition, 2009. ISBN 81-203-2141-3, PHI

2. Jon Kleinberg, Eva Tardos "Algorithm Design", 1st edition, 2005. ISBN 978-81-317-0310-6, Pearson

3. Dasgupta, Papadimitriu, Vazirani "Algorithms", 1st edition (September 13, 2006), ISBN-10: 9780073523408, ISBN-13: 978-0073523408, McGraw-Hill Education

Reference Books: (As per IEEE format)

1. Motwani, Raghavan "Randomized Algorithms", 1stedition (August 25, 1995), ISBN-10: 0521474655, ISBN-13: 978-0521474658, Cambridge University Press

2. Vazirani, "Approximation Algorithms", ISBN-10: 3642084699, ISBN-13: 978-3642084690, Springer (December 8, 2010)

Moocs Links and additional reading material:www.nptelvideos.in

Course Outcomes:

The student will be able to –
1) Formulate a given computational problem in an abstract and mathematically precise manner.
2) Choose a suitable paradigm to design an algorithm for given computational problems.
3) Understand asymptotic notations and apply suitable mathematical techniques to find asymptotic time and space complexities of algorithms.
4)Understand notions of NP-hardness and NP-completeness and their relationship with the

intractability of decision problems.
5)Apply randomized, approximation algorithms for given computational problems.
6) To incorporate appropriate data structures, algorithmic paradigms to craft innovative scientific solutions for complex computing problems.

CO PO Map:

CO	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO13	PSO14	PSO15	PSO16
CO1	2	3							3							
CO2	1		3	2		3	1							2		3
CO3	3			3	3				3			3	2			3
CO4		3		3						2				3		
CO5	2		3												2	
CO6	3	3			3								2			

CO attainment levels:

CO	CO1	CO2	CO3	CO4	CO5	CO6
Level	1	2	3	3	4	4

Future Courses Mapping: Advanced Algorithms, Computational Geometry, Algorithmic Number Theory, Algorithmic Graph Theory, Motion planning and Robotics

Job Mapping: Algorithm design is an essential component of any job based on programming. All Industries in IT Engineering always look for a strong knowledge in Algorithm design and Data structures for positions like Developer, Architect, Principal Engineer, Backend lead engineer, Full stack developers, Solution architect, Solution / Senior engineer, Technical lead etc

FF No. : 654

IT3205::Engineering Design and Innovation

Course Relevance: Project Centric Learning (PCL) is a powerful tool for students to work in areas of their choice and strengths. Along with course-based projects, curriculum can be enriched with semester long Engineering Design and Development courses, in which students can solve socially relevant problems using various technologies from relevant disciplines. The various socially relevant domains can be like Health care, Agriculture, Defense, Education, Smart City,Smart Energy and Swaccha Bharat Abhiyan. To gain the necessary skills to tackle such projects,students can select relevant online courses and acquire skills from numerous sources under guidance of faculty and enrich their knowledge in the project domain, thereby achieving project centric learning. Modern world sustained and advanced through the successful completion of projects. In short, if students are prepared for success in life, we need to prepare them for a project-based world. It is a style of active learning and inquiry-based learning. Project based learning will also redefine the role of teacher as mentor in the learning process. The PCL model focuses the student on a big open-ended question, challenge, or problem to research and respond to and/or solve. It brings students not only to know, understand and remember rather it takes them to nalyze, design and apply categories of Bloom's Taxonomy.

SECTION-1

Preamble - The content and process mentioned below is the guideline document for the faculties and students to start with. It is not to limit the flexibility of faculty and students;rather they are free to explore their creativity beyond the guideline mentioned herewith. For all courses of ED, laboratory course contents of "Trends in Engineering Technology" are designed as a ladder to extend connectivity of software technologies to solve real world problems using an interdisciplinary approach. The ladder in the form of gradual steps can be seen as below:

Industry Communication Standards, Single Board Computers and IoT, Computational Biology(Biomedical and Bioinformatics), Robotics and Drone, Industry 4.0 (Artificial Intelligence,Human Computer Interfacing, 5G and IoT, Cloud Computing, Big Data and Cyber Securityetc).

Suggest an assessment Scheme:

MSE and ESE

Text Books: (As per IEEE format)

1. A new model of problem-based learning. By Terry Barrett. All Ireland Society for higher education (AISHE).

ISBN:978-0-9935254-6-9; 2017

2. Problem Based Learning. By Mahnazmoallem, woei hung and Nada Dabbagh, Wiley Publishers. 2019.

Stem Project based learning and integrated science, Technology, Engineering and mathematics approach. By

Robert RobartCapraro, Mary Margaret Capraro

Reference Books: (As per IEEE format)

1. De Graaff E, Kolmos A., red.: Management of change: Implementation of problem-based and project-based

learning in engineering. Rotterdam: Sense Publishers. 2007.

2. Project management core textbook, second edition, Indian Edition , by Gopalan.

3. The Art of Agile Development. By James Shore & Shane Warden.

Moocs Links and additional reading material: www.nptelvideos.in

Course Outcomes:

On completion of the course, learner will be able to–

CO1: Identify the real life problem from societal need point of view

CO2: Choose and compare alternative approaches to select most feasible one

CO3: Analyze and synthesize the identified problem from technological perspective

CO4: Design the reliable and scalable solution to meet challenges

CO5: Evaluate the solution based on the criteria specified

CO6: Inculcate long life learning attitude towards the societal problems

CO-PO Map:

	Program Outcomes												Program Specific Outcomes			
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 13	PSO 14	PSO 15	PSO 16
CO1	1	3	3			3								3		

CO2	2			1	2									2	
CO3	3		3		2			3	1				3			
CO4	2	2				3										
CO5	3		3				3		3		3				3	3
CO6	3	2			2					3		3				

FF No. : 654

IT3206::Engineering Design -I

Engineering Design (ED) laboratory course contents are planned to apply software tools and technologies to solve real world problems for benefit of society. Major emphasis is on followingrepresentative domains: Health Care, Agriculture, Defense, Finance, Automation, Education,Security, Renewable Energy, Smart City, Surveillance and etc.

ED Philosophy- This course is planned to motivate the students for Entrepreneurship and industry readiness

Course Outcomes

On completion of the course, learner will be able to–

CO1: Identify the real life problem from societal need point of view

CO2: Choose and compare alternative approaches to select most feasible one

CO3: Analyze and synthesize the identified problem from technological perspective

CO4: Design the reliable and scalable solution to meet challenges

CO5: Evaluate the solution based on the criteria specified

CO6: Inculcate long life learning attitude towards the societal problems

CO PO Map:

	Program Outcomes												Program Specific Outcomes			
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO13	PSO14	PSO15	PSO16
CO1	1	3	3			3								3		
CO2	2			1	2										2	
CO3	3		3		2			3	1				3			
CO4	2	2				3										
CO5	3		3				3		3		3				3	3
CO6	3	2			2					3		3				

FF No. : 654

IT3207::Web Technology and Cloud Computing

Course Prerequisites: Computer Programming, Database, Operating System and Computer Network

Course Objectives:

1. To get concepts of the HTML and CSS.
2. To obtain knowledge of client side web technologies
3. To acquire skills of server side web technologies
4. To learn use of various services of CLOUD
5. To understand Data, ML, AI, security functionalities of CLOUD

Credits: 5 **Teaching Scheme Theory:** 3Hours/Week

Tut: 1Hours/Week

Lab:2 Hours/Week

Course Relevance: Web development is the work involved in developing a website for the Internet or an intranet . Web development can range from developing a simple single static page of plain text to complex web-based internet applications (web apps), electronic businesses, and social network services.Cloud Computing is the on-demand solution for storing and retrieving data globally. cloud computing has become a very integral part of the entire infrastructure of the

IT industry.

SECTION-1

Introduction: Internet and WWW, web site planning and design issues, structure of html document, document structure tags, page structure tags, logical and physical tags, alignment, heading, commenting, formatting tags, text level formatting, block level formatting, list tags, hyperlink tags, image and image maps, table tags, frame tags, form tags, Difference between HTML and HTML5.

CSS: Introduction to Style Sheet,Need, Inserting CSS in an HTML page, CSS selectors

Client Side Technologies: JavaScript: Overview of JavaScript, Data types, Control Structures, Arrays, Functions and Scopes, Objects in JS, DOM: DOM levels, DOM Objects and their properties and methods, Manipulating DOM, JQuery: Introduction to JQuery, Loading JQuery, Selecting elements, changing styles, creating elements, appending elements, removing elements, handling events.

Server Side Technologies: Introduction to PHP, features, sample code, PHP syntax, control structures, functions, arrays, string manipulation, form handling, include and require statements, file handling, Error Handling and Reporting ,Introduction to Object-oriented PHP: classes and constructors, PHP and HTTP environment variables, Using GET, POST, SESSION and COOKIE variables, MySQL with PHP: built-in database functions, connecting to a MySQL, selecting a database, building and sending query to database engine, retrieving, updating and inserting data, introduction to AJAX, AJAX with PHP, AJAX with database.

SECTION-1I

Introduction to Cloud Computing, Definition, Characteristics, Components, Cloud Service Models: SaaS, PaaS, IaaS, Cloud provider, benefits and limitations, Deploy application over cloud, Cloud computing vs. Cluster computing vs. Grid computing. Open Stack vs Cloud Stack, Role of Open Standards, Infrastructure as a Service (IaaS): Virtualization Technology: Different approaches to virtualization, Hypervisors, Machine Image, And Virtual Machine (VM). Virtualization: Server, Storage, Network. Virtual Machine (resource) provisioning and manageability, storage as a service, Data storage in cloud computing(storage as a service),Multitenant software: Multi-entity support, Multi-schema approach, Multitenance using cloud data stores, Data access control for enterprise applications,Cloud file-systems: GFS and HDFS, BigTable, Features and comparisons among GFS, HDFS etc.,Databases on Cloud: NoSQL, MogoDB, HBase, Hive, Dynamo, Graph databases

Map-Reduce and extensions: Parallel computing, The map-Reduce model, Parallel efficiency of Map-Reduce, Relational operations using Map-Reduce, Example/Application of Map-reduce,PaaS: Introduction to PaaS - What is PaaS, Service Oriented Architecture (SOA). Cloud Platform and Management - computation, storage

SaaS: Introduction to SaaS, Web services, Web 2.0, Web OS, Case Study on SaaS **Service Management in Cloud Computing:** Service Level Agreements(SLAs), Billing & Accounting, Comparing Scaling Hardware: Traditional vs. Cloud, Economics of scaling: Benefitting enormously, Managing Data - Looking at Data, Scalability & Cloud Services, Database & Data Stores in Cloud, Large Scale Data Processing

Cloud Security: Infrastructure Security - Network level security, Host level security, Application level security. Data security and Storage - Data privacy and security Issues, Jurisdictional issues raised by Data location: Identity & Access Management, Access Control, Trust, Reputation, Risk, Authentication in cloud computing, Client access in cloud, Cloud contracting Model, Commercial and business considerations.

List of Tutorials: (Any Three)

1) Learn various HTML tags
2) Use of CSS tags in web page designing
3) Understand use of Javascript objects in web page designing
4) Configuration and Installation of PHP
5) Web based application development using AJAX framework
6) Setup and configure cloud environment
7) Study of EC2 cloud
8) Deploy and manage cloud environment
9) Study of performing Data, ML task in cloud
10) Study of performing ML/AI task in cloud

List of Practicals: (Any Six)

1)Design a web page to demonstrate the use of different HTML tags and use of inline, internal and external CSS.
2) Design a HTML form for student registration and perform validation using JavaScript.
3)Write a PHP Script to perform file handling operations like creating, reading, copying, moving, deleting, updating and uploading.
4)Design a dynamic web application using PHP and MYSQL as back-end for student data with insert, delete, view and update operation.
5) Design a dynamic web application using PHP, AJAX and MYSQL as back-end for student data with insert and view operation.
6) Implement application using NoSQL for cloud
7) Implement application using Map-Reduce for cloud
8) Implement SaaS application and host it on Cloud Platform
9) Create a local repository using git on a Linux instance running in EC2
10) Create an Amazon Virtual Private Cloud (Amazon VPC)

List of Projects:

1. Student Registration System
2. Tours and Travel System
3. Canteen Food Ordering and Management System.
4. Online personal counseling
5. Online recruitment System
6. Farming Assistant Web Service
7. Cloud based Attendance system
8. University campus online automation using Cloud
9. Cloud based student information chatbot
10. E-learning platform using cloud computing

List of Course Seminar Topics:

1. EJB
2. Bootstrap
3. Spring Framework
4. Joomla
5. Progressive Web Apps
6. Servlet
7.Object Oriented PHP
8. Client side technology
9. Server side technology
10. Web Technology frameworks

List of Course Group Discussion Topics:

1. Cloud Service Models
2. Cloud computing vs. Cluster computing vs. Grid computing
3. Virtualization
4. Cloud file-systems
5. Cloud data stores
6. Databases on Cloud
7. Map-Reduce model for Cloud
8. Data security and Storage for Cloud
9. Application security for Cloud
10. Commercial and business risk and opportunities in Cloud

List of Home Assignments:

Design:

1. Design, Develop and Deploy social web applications using Bootstrap.
2. Design, Develop and Deploy web applications using CMS.
3. Design, Develop and Deploy web application for department/college
4. Design Local Train ticketing system using Cloud
5. Design online Book-store system using Cloud

Case Study:

1. Secure file storage in Cloud
2. Android offline computations over Cloud
3. Data leak detection in E-commerce cloud applications.
4. e-Bug tracking in Cloud
5. Rural Banking using Cloud
6. Wordpress
7. Angular JS

Blog:

1.Recent web development trends
2.Databases for web developers
3.Web services
4. Private Vs Public Cloud
5. Storage and Energy efficient Cloud computing

Surveys:

1. Comparison of web services
2. Frameworks for web development
3. Scripting languages for Web Designing.
4. Public cloud security
5. Cloud based Improved file handling

Suggest an assessment Scheme:

1.Home Assignment
2.MSE/ESE
3.CVV
4.Seminar
5.Group Discussion
6.LAB-Course Assignment and Project Evaluation

Text Books: (As per IEEE format)

1.Thomas A. Powell; "Complete reference HTML"; 4th edition, Tata McGraw-Hill Publications
2. Black book; "Web Technologies:HTML,JS,PHP,Java,JSP,ASP.NET,XML and AJAX" ; Dreamtech Press, 2016.
3.Dave Mercer, Allan Ken; "Beginning PHP 5"; Dreamtech Publications.
4. Judith Hurwitz, R.Bloor, M.Kanfman, F.Halper, "Cloud Computing for Dummies", Wiley India.
5. Ronald Krutz and Russell Dean Vines, "Cloud Security", Wiley-India

Reference Books: (As per IEEE format)

1. Jeremy McPeak& Paul Wilton; "Beginning JavaScript"; 5th Edition, Wrox Publication.
2. Robin Nixon; " Learning PHP, MySQL, JavaScript, CSS and HTML 5";4thEdition,'Reilly publication.
3. Barrie Sosinsky, "Cloud Computing Bible", Wiley India
4. Antohy T Velte, et.al, "Cloud Computing : A Practical Approach", McGraw Hill.
5. McGraw Hill, "Cloud Computing", Que Publishing.

Moocs Links and additional reading material:

1. www.nptelvideos.in
2. https://www.udemy.com
3. https://learn.saylor.org
4. https://www.coursera.org
5. https://swayam.gov.in
6. https://www.w3schools.com

Course Outcomes:

The student will be able to –

1) Design reliable, efficient, scalable front end view of web pages using HTML5, CSS with Bootstrap framework.
2) Perform client side web page form validation.
3) Deliver realistic and extensible lightweight web application using PHP
4) Illustrate the architecture and infrastructure of cloud computing, including SaaS, PaaS, IaaS, public cloud, private cloud, hybrid cloud.
5) Develop solution for a given business case using Map-Reduce model, resource virtualization
6) Identify the appropriate file system and database for a given business case.

CO PO Map:

	Program Outcomes												Program Specific Outcomes			
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO13	PSO14	PSO15	PSO16
CO1	3		3							3	3				3	
CO2	2				3							2				
CO3	2	2			2				3							
CO4	3	2											3			
CO5	3	2				3	3	3	3			2				3
CO6	2	3		3	2								2	3		

CO attainment levels:

CO	CO1	CO2	CO3	CO4	CO5	CO6
Level	2	3	4	2	5	3

Future Courses Mapping: Advance web technology

Job Mapping: Web developer,Front end developer,Back end developer,Full stack developer, cloud architect, cloud developer

FF No. : 654

IT3208:: Object Oriented Programming and Problem Solving

Course Prerequisites: Basic Knowledge about C

Course Objectives:

1. Employ a problem-solving strategy to breakdown a complex problem into a series of simpler tasks.

2. Develop effective solutions using for real world problems using the concepts of Object oriented programming.

3. Develop generic solution for different problem domain.

4. Apply concepts of pure object oriented programming to develop solutions for different platforms.

5. Develop solutions for multi user environment**.**

Credits: 5 **Teaching Scheme Theory:** 3 Hours/Week

Tut: 1 Hours/Week

Lab: 2 Hours/Week

Course Relevance: Advance Java, Python, other object oriented programming languages

SECTION-1
General Problem Solving Concepts-Types of problems, problems solving with computers, difficulties with problem solving, Problem Solving Aspects, Problem Solving Concepts for computer- constants and variables, data types, functions, operators, expressions and equations, Programming Concepts – communicating with computers, organizing the problem, using the tools, testing the solution, coding the program, Top down design. Programming paradigms: Imperative/Procedural, Object Oriented, Functional Programming, Logic Programming. Need of Object-Oriented Programming (OOP), Basic Concepts of OOP, Benefits/ applications of OOP. C++ Programming: Basics, Data Types, Structures, Class, Object, class and data abstraction, class scope and accessing class members, separating interface from implementation, controlling access to members. Functions: Function prototype, Constructors, Destructors, Copy Constructor, Objects and Memory requirements, Static Class members, Data abstraction and information hiding, Inline function, Friend Functions. Operator Overloading: Concept, Operator overloading, Overloading Unary Operators, Binary Operators.

Inheritance: Base Class and derived Class, protected members, relationship between base Class and derived Class, Constructor and destructor in Derived Class, Overriding Member Functions, Types of Inheritance, Public and Private Inheritance, Ambiguity in Multiple Inheritance, constructors in derived classes, Aggregation. Polymorphism: Concept, Types of polymorphism, relationship among objects in inheritance hierarchy, Function overloading, Virtual Functions: Pointers- indirection Operators, Memory Management: new and delete, this pointer, Pointers to Objects, Pointer to derived classes, Function pointers, Pure virtual function, Abstract classes, Templates.

SECTION-1I

Java characteristics, Classes and Objects, Methods and Constructors. Information hiding: access modifiers, Static keyword: class variables and instance variables, Class methods and instance methods. Arrays, Strings. Inheritance: Types of inheritance, Constructors in Derived Classes, Overriding & Hiding Fields & Methods, Interfaces. Polymorphism: Static and Dynamic. Abstract classes & methods, Final classes & methods. Exceptions, checked & unchecked exceptions, User-defined exceptions. Multithreading: Thread life Cycle, Thread Priority, Thread Methods, Inter-thread Communication, Producer-Consumer using Java. Introduction to Streams, types of streams: iostreams, Readers and Writers, Print writer, Stream Benefits. File management: File Management and Processing, Primitive Data Processing, Object Data Processing, Java GUI: Applet, Applet Vs Application. AWT, Swing, Components. Layout Manager: Flow, Border, Grid and Card. Label, Button, Choice, List, Event Handling (mouse, key), Menus, Jtables, Database connectivity

List of Tutorials: (Any Three)

1) Discuss different types of operators and their hierarchy. Solve few examples of expressions having different types of operators.
2) Discuss different types of variables in programming like local and global. Write programs and differentiate between them.
3) Discuss six steps of problem solving. Explain top-down design to solve a problem.
4) Write a program to initialize the three sides of a triangle using different types of constructor and calculate the area of the triangle.
5) What is Inheritance? How many types of Inheritance exists in C++ and Java?
6) Write a program to show the following using Inheritance:
i. A base class Appliance will be there having attributes like Name, Brand. Under this create derived classes like- AC, Laptop and TV.
ii. AC class has properties like Energy rating, Capacity in tons.

iii. Laptop class has properties like Processor name, capacity of RAM.
iv. TV class has properties like size in inches and its type either normal or smart.
Create a disp() function in all the derived class to display the base class as well as derived class properties.
7) What do you mean by Polymorphism? How many types of Polymorphism exist? What is the difference between different types of Polymorphism? Demonstrate through some example.
8) What do you mean by Generic programming? How template in C++ used to implement Generic programming? Explain with an example.
9) Access a file in Java. Copy the content one file in another file using Reader and Writer.
10) Discuss different GUI components. Implement a Form using Swing.

List of Practicals: (Any Six)

1. Program to calculate area of square & other function to calculate area of circle, overload these two functions. Function parameter accept from user (Use function Overloading concepts).

2. Use Dynamic initializations of object concept Write a class cString having following

• Data Abstraction

• Length of string (int)

• Base address of the string (char *) Procedural Abstraction

• Default constructor, Parameterized constructor having char * parameter

• Copy constructor

• AcceptString()

• DisplayString()

• Destructor()

3. Operator overloading-I Write a class Complex containing members as m_real and m_imag. Overload binary +, binary -, unary -, ++ and – operators

4. Operator overloading-II Write a class cString and overload assignment, insertion and extraction operators for it.

5. Design a C ++ class string to overload < and > operator.

6. Single Inheritance: Derive class cWageEmployee from cEmployee. Multiple Inheritance:Derive classcWageEmployee , cManager from cEmployee .Create two derived classes called test-containing marks of two subjects & other derived class called result calculates result of the student. Use multilevel Inheritance.

7. Virtual base class concept Write a c++ program for display the result of the student as a

class student accept roll no of the student, class test accept marks of the two subjects, in class sports accept student's sports marks. All the informationof the above classes display in the result class. Use virtual base class concept. Pure virtual base class Write a C++ program for calculate area of circle & rectangle. Create class shape & two other classes circle & rect. Use pure virtual class function concept 8. Program for unstructured Exception:

• divide by zero

• Array index out of bounds exception

•Null pointer Exception

•Using structured exception handlings catch these exceptions.

9. Template function & Namespace Write program for bubble sort using template and namespace. Template class Write program for linked stack using template.

10. Display area and volume of different shapes(Use class, object, constructor, overloading)using java

11. Display bank account information(Use interface and inheritance using java)

12. Read content of one file and write it into another file.

List of Projects:

1. MCQ Test
2. Encryption Decryption Using DES Algorithm
3. Cricket Score Maintenance
4. Online Kirana Store
5. Determining Class, Network, Host ID's of IP address
6. MP3 player
7. Casino Game
8. Tic-Tac-Toe Game
9. Routing Algorithm
10. Asteroids Game
11. snake game

List of Course Seminar Topics:

1. Approaches of Problem solving
2. Access specifiers in C++
3. Constructors and destructor in C++
4. Memory management in C++
5. Static Binding
6. Programming paradigms
7. Friend function in C++
8. Different types of function calls
9. Late Binding
10. Templates

List of Course Group Discussion Topics:

1. Types of Inheritance in Java
2. Memory management in Java
3. Components of Swing
4. Event handling in Java
5. Types of exceptions in Java
6. Types of Layouts in Java
7. Thread life cycle
8. Applets in Java
9. File management in Java
10. Inter thread communication in Java

List of Home Assignments:

Design:

1. Student admission system.
2. Library management system
3. Hotel management system
4. Online shopping
5. Cab management system

Case Study:

1. Address book using Swing and Files
2. Book Shopping cart using Swing and Database
3. Text editor using Swing
4. Online MCQ test using Multithreading
5. Inventory Management using frontend as Swing and backend as My SQL.

Blog:

1. Generic classes in C++

2. Types of Exceptions in C++
3. Types of Constructors in C++
4. JDBC
5. Producer and Consumer problem

Surveys:

1. Different GUI components in Swing
2. Types of Streams in Java
3. Mouse event handling
4. Multithreading based applications
5. Types of inheritance in C++

Suggest an assessment Scheme:

1.MSE-15 Marks
2. ESE-15 Marks
3. Lab-20 Marks
4. HA-10 Marks
5. Viva-20 Marks
6. Seminar-10 Marks
7. Group Discussion-10 Marks

Text Books: ***(As per IEEE format)***

1. E. Balagurusamy; "Object oriented programming with C++"; 4th Edition,TataMcGrawHill.

2. Herbert Schildt; "Java: The Complete Reference"; 7th Edition, Tata McGraw Publication.

Reference Books: ***(As per IEEE format)***

1. R. Lafore; "The Waite Group's Object oriented Programming in C++"; 3rd Edition, Galgotia Publications.

2. E. Balagurusamy; "Programmmng with Java";5th Edition,Tata McGraw-Hill.

3. Cay S Horstmann, Gary Cornell; "Core Java 2 Volume – I ", 8th Edition, Pearson Education.

4. BjarneStroustrup ;" Object-Oriented Programming in C++ " ;4th Edition, Sams Publishing.

Moocs Links and additional reading material:

1. C++ Introduction | C ++ Tutorial | Mr. Kishore- Naresh Technology- https://www.youtube.com/watch?v=l0qvxPPISuY&list=PLVlQHNRLflP8_DGKcMoRw-TYJJALgGu4J

2. Programming in C plus plus – Prof P.P. Das- NPTEL https://www.youtube.com/watch?v=LZFoktwiars&list=PL0gIV7t6l2iIsR55zsSgeiOw9Bd_IUTbY

Course Outcomes:

The student will be able to –

1. Apply different problemsolving approaches using C++ to solve real world problems.
2. Develop real world applications using class, inheritance and polymorphism in C++.
3. Develop generic solutions using templates.
4. Create solutions to problems by applying the knowledge of Exception handling and Threads.
5. Design an application using Java I/O's, File handling.
6. Solve real world problems with the help of event-based GUI handling principles.

CO PO Map:

	Program Outcomes												Program Specific Outcomes			
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO13	PSO14	PSO15	PSO16
CO1	3	2				3							3			
CO2	3		3		3	3	2	2	3						3	3
CO3	3		3		3		2	2	2						3	
CO4	2	2		3										3		
CO5	3		3		3		2	2	2	3	3				3	
CO6	2	2				3						3				2

CO attainment levels:

CO	CO1	CO2	CO3	CO4	CO5	CO6

Level	3	3	2	2	1	3

Future Courses Mapping: Advanced Java, Spring Frame Work, Grails Frame Work

Job Mapping: Java Programmer, Application Developer, Design Engineer

FF No. : 654

IT3209::Software Design Methodologies

Course Prerequisites: Mastery of programming in a high-level, object-oriented language,Familiarity with data structures and algorithms.

Course Objectives:

1.Understanding object-oriented analysis and design.

2.Learn different software process models and principles and practices

3.Practicing UML to model OO systems

4.Familiarity with current models and standards for design.

5.Exposure to organizational issues in software design.

6.An ability to analyze and evaluate problems and draw on the theoretical and technical knowledge to develop solutions and systems

Credits: 5 **Teaching Scheme Theory:** 3Hours/Week

Tut: 1Hours/Week

Lab:2 Hours/Week

Course Relevance: Software Architecture

SECTION-1
Overview of Software Engineering, Software Process Framework, Process Patterns, Personal and Team Process Models, Process Models: Code-and-Fix, Waterfall Model, Incremental Models, Evolutionary Models, Iterative Development, The Unified Process, Agile process, Extreme Programming, Cleanroom Methodology, CMMI, Impact of Processes and Outcomes, Process Selection and applicability, Software Engineering Principles and Practices,The importance of modeling, UML Building blocks: things, relationships and diagrams, Architectural views: use case, design, implementation, process and deployment, Levels of detail: visualization, specification and construction, Object properties: Abstraction, encapsulation, Modularity, Hierarchy. Requirements Engineering Tasks, Requirement Elicitation Techniques, Software Requirements: Functional, Non-Functional, Domain, Requirements Characteristics and Characterization, Requirement qualities, Requirement Specification, Requirement Traceability, System Analysis Model Generation, Requirement Prioritization, Context Models, Behavioral Models, Data Models, Object Models, Structured Methods, Use Case Diagrams, Sequence Diagrams, State Chart Diagrams, Activity Diagrams,Design quality, Design Concepts, The Design Model, Introduction to Pattern-Based Software Design, Architecture styles, Reference Architectures Architectural Design: Software Architecture, Data Design and Architectural Design, Design of Software Objects, Features and Methods, Cohesion and Coupling between Objects, Coupling and Visibility, Interfaces, Interfaces with Ball and Socket Notation,

Templates, Analysis model vs. design model classes, Categorizing classes: entity, boundary and control , Modeling associations and collections,Component and deployment diagrams.

SECTION-1I

Software Architecture Vs Software Design:Design process and Design quality, Design concepts, the design model, pattern based software design,Software Design Approaches, Structured Analysis, Structured Design. Software Architecture Relationships to Other Disciplines, Foundations of Software Architecture, Software architecture in the context of the overall software life cycle ,Role of Software Architect, Architectural Styles, Architectural Frameworks, Designing, Describing, and Using Software Architecture, Global Analysis, Conceptual Architecture View, Module Architecture View, Execution Architecture View, Code Architecture View.
Introduction to software Patterns: Architectural Patterns, Design Patterns and Idioms.Architectural Patterns: Blackboard, Pipe and filter, Design Patterns proposed by GoF:Creational Patterns, Structural Patterns, and Behavioral Patterns.

User Interface:Design, Performing User interface design: Golden rules, User interface analysis and design, interface analysis, interface design steps, Design evaluation. Coding and Documentation.

List of Tutorials: (Any Three)

1) Goals of software engineering
2) Software process models, life cycle models
3) Process improvement, Capability Maturity Model
4) Unified Modeling Language (UML)
5) Design patterns
6) Frameworks, software product lines
7) Software architecture
8) Software measurements and metrics
9) Software estimation methods
10) Static and dynamic analysis
11)Version control, configuration management
12) Software quality, verification and validation, software testing

List of Practicals: (Any Six)

1. To study modeling methodologies and identify their applicability to various categories of projects
2. To understand Requirement Elicitation Techniques and recognize types of requirement while preparing System Requirement Specification.
3. To study MDD / MDA and identify the importance of Model Transformation.
4. To study types of MOF and metamodel concepts for various diagrams in UML 2.0.
5. To identify System Scope, Actors, Use Cases, Use Case structuring for a given problem and perform Use Case narration in template form with normal/alternate flows.
6. To identify Entity, Control, Boundary objects and trace object interactions for scenarios from use cases.
7. To identify object states, transitions, entry-exit points, concurrency, action parallelism and prepare a state chart diagram for given object scenario.
8. To prepare detailed Activity diagram with notational compliance to UML 2.0 indicating clear use of pins, fork-join, synchronization, datastores.
9. To prepare Class diagram for a defined problem with relationships, associations, hierarchies, interfaces, roles and multiplicity indicators.
10) To prepare Component and Deployment diagram for a defined problem.

List of Projects:

1.ERP system
2.Hospital Management
3.Railway Reservation
4.Stock market management
5.Parking automation
6.Library Management
7.Online shopping
8. Content management

List of Course Seminar Topics:

1. CMMI
2. Process Models
3. Agile Methodology
4. Modelling using UML
5. Analysis and Design in OO systems
6. Requirement Engineering
7. Principles and Practices of good Software Design
8. Collaborative software development
9. Component diagram
10. Deployment diagram

List of Course Group Discussion Topics:

1.Traditional Vs Agile
2.Phases of SDLC.Which is more important?
3.UML modeling
4.Analysis Vs Design
5.Design Patterns
6.Design Vs Architecture
7.Architechture style
8.Design Vs Framework
9.Framework Vs Architecture
10.Archetype patterns

List of Home Assignments:

Design:

1.Requirement Engg steps
2.Analysis modeling
3.design modeling
4.Architechtural styles
5.design patterns

Case Study:

1.Imaging Software architecture
2.Banking Software architecture
3.ERP Software architecture
4.Online Shopping Software architecture
5.AI Software architecture

Blog:

1.Software Engg Do's and Don'ts
2.Which Process Model?
3.Scrum
4.Devops
5.Data ops

Surveys:

1.Software Design
2.Software Methodologies
3.Software Architectures
4.Design Patterns

5.Architechtural Patterns
Suggest an assessment Scheme: 1. MSE 2. ESE 3. PPT 4. GD 5. Viva 6. Lab/Project
Text Books: (As per IEEE format)
1. Roger S Pressman ,"Software Engineering: A practitioner's Approach", 6th edition. McGraw Hill International Edition, 2005 2. Craig Larman ,"Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design", Addison-Wesley, 1998.
Reference Books: (As per IEEE format)
1. Pankaj Jalote ,"Software Engineering, A Precise Approach", Wiley India, 2010. 2. Waman S Jawadekar, "Software Engineering : A Primer", Tata McGraw-Hill, 2008 3. RajibMall ,"Fundamentals of Software Engineering", PHI, 2005 4. Deepak Jain,"Software Engineering, Principles and Practices", Oxford University Press. 5. Diner Bjorner ,"Software Engineering1: Abstraction and modeling", Springer International edition, 2006
Moocs Links and additional reading material:www.nptelvideos.in

Course Outcomes:
The student will be able to –

1. Summarize capabilities and impact of Software Development Process Models and justify process maturity through application of Software Engineering principles and practices focusing tailored processes that best fit the technical and market demands of a modern software project.

2. Discriminate competing and feasible system requirements indicating correct real world problem scope and prepare stepwise system conceptual model using stakeholder analysis and requirement validation.

3. Formulate system specifications by analyzing User-level tasks and compose software artifacts using agile principles, practices and Scrum framework.

4. Propose and demonstrate realistic solutions supported by well-formed documentation with application of agile roles, sprint management, and agile architecture focusing project backlogs and velocity monitoring.

5. Conform to Configuration Management principles and demonstrate cohesive teamwork skills avoiding classic mistakes and emphasizing on software safety adhering to relevant standards.

6. Analyze the target system properties and recommend solution alternatives by practicing project planning, scheduling, estimation and risk management activities.

CO PO Map:

	Program Outcomes												Program Specific Outcomes			
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO13	PSO14	PSO15	PSO16
CO1	3	2			3								2			
CO2	1	2		3		3	3							2		
CO3	3	3			1										3	
CO4	3	3	3		3	1		3								
CO5	3								3					3		
CO6	2									3	3	3			3	3

CO attainment levels:

CO	CO1	CO2	CO3	CO4	CO5	CO6
Level	2	2	3	4	5	3

Future Courses Mapping: Project Management,Software Architecture
Job Mapping: Software Engineer,Project Manager,Software Architect

FF No. : 654

IT3210::Internet of Things

Course Prerequisites: Computer Networks, Computer Programming

Course Objectives:

1. Understand the IOT Terminology and Technology
2. Describe IOT applications.
3. Analyze Protocol standardization for IOT
4. Perform an analysis of IOT security issues
5. Identify the role of cloud computing in IOT.

Credits: 4 **Teaching Scheme Theory:** 3Hours/Week

Lab:2 Hours/Week

Course Relevance: IoT or Internet of Things is primarily a full system of all the interconnected computing devices, having all the mechanical and digital machines. IoT is beneficial because it makes our work easy and is very less time-consuming.IoT has got a lot more scope in terms of making a career and even exploring more opportunities if starting up with their own business. The words such as cyber-attack, hacking we can hear these too jointly with IoT. Despite, of the fear of piracy and cyber attack the internet of things and IoT applications will grow much faster in the coming years.

SECTION-1
Introduction to Internet of Things – Definition &Characteristics, Importance of IoT,Physical Design of IOT, Logical Design of IOT, IOT Enabling technologies, IOT Levels & Deployment Templates,IoT and M2M, IoT System Management with NETCONF-YANG **IOT Platform Design Methodology –** Purpose & Requirements Specification, Process Specification, Domain Model Specification, Information model Specification, Service specification, IOT level Specifications, Functional View Specifications, Operational View Specification, device and component integration, application development **IoT Smart X Application -** Smart Cities, Smart Energy & Smart Grid, Smart Mobility & transport, Smart Home, Smart Building & Infrastructure, Smart Factory & Manufacturing, Smart Health, Smart Logistics & Retails. **Embedded suite for IoT Physical device –** Arduino / Raspberry Pi Interfaces, Hardware requirement of Arduino / Pi, Connecting remotely to the Arduino /Raspberry Pi , GPIO Basics, Controlling GPIO Outputs Using a Web Interface,– Programming , APIs / Packages, Arduino Interfaces, Integration of Sensors(photo sensor, IR, temperature,ultrasoni,etc) and Actuators with Arduino,Python packages of interest for IOT
SECTION-1I

Connectivity Technologies and Communication Protocols in IOT: RFID: Introduction, Principle of RFID, Components of an RFID system, RFID Protocols & NFC protocols,
Wireless Sensor Networks: WSN Architecture, the node, connecting nodes, Networking Nodes, Securing Communication WSN specific IoT applications, **Protocols in IOT:** CoAP, XMPP, AMQP, MQTT, Communication Protocols: IEEE 802.15.4, Zig-bee, 6LoWPAN, Bluetooth, WirelessHART
Resource Management In The Internet Of Things: Clustering, Software Agents,
Clustering Principles in an Internet of Things Architecture, Design Guidelines, and Software Agents for Object Representation, Data Synchronization.
Internet of things Challenges: Vulnerabilities of IoT, Security, Privacy & Trust for IoT, Security requirements Threat analysis, Use cases and misuse cases, Introduction to cloud computing, Role of Cloud Computing in IoT, Cloud-to-Device Connectivity,Cloud data management, cloud data monitoring, Cloud data Exchange
Case Studies Illustrating IOT Design – Smart lighting, Home Intrusion Detection, Smart Parking, Weather Monitoring System, Weather Report Bot, Air Pollution Monitoring, Forest fire Detection, Smart Irrigation, IoT Printer

List of Practicals: (Any Six)

1)Installation of the operating system on Raspberry Pi-3
2)Arduino / Raspberry Pi interface to GSM module
3)Arduino / Raspberry Pi interface to Wi-fi module
4)Arduino / Raspberry Pi interface to Bluetooth module
5)Write a code to identify the object and notify the user
6)Write a code to connect the PIR and IR sensor, led and toy motor.
7)Write a code to connect the ultrasonic sensor
8)Understanding of connectivity and configuration of the camera module with raspberry pi. Write a code to capture and store image
9)Write a web application to access LED from the internet.
10)Write a web application to send sensor data to the cloud using MQTT communication Protocol.

List of Projects:

1.Being Social on Twitter & update status on Twitter through Arduino.
2. IoTTemperature monitor for greenhouse.
3. Arduino Based Home Security System.
4. Arduino Based Heart Rate Monitor:
5. A fall detection system based on Arduino, Windows and Azure
6. Voice Controlled Mini Home Automation using Android Smartphone.
7. Control Devices using Localhost Web Server for Home Automation.
8. Minimizing Electricity Theft by Internet of Things.
9. Internet-of-Things Based Ubiquitous Healthcare Systems.
10. A Design of the IOT Gateway for Agricultural Greenhouse

List of Course Seminar Topics:

1. IOT Protocols
2.IOT Vs M2M
3.Ubiquitous IoT Applications
4.IoT Enabling technologies
5.RPi operating system features over Arduino
6.Arduino architecture and its interfacing techniques
7.IPv6 technologies for the IoT.
8. Sensors in IOT
9.IoT System Management with NETCONF-YANG
10. Future IOT

List of Course Group Discussion Topics:

1.IoT Challenges
2. MQTT Vs CoAP
3. LoWPAN
4. WSN architecture
5. Role of cloud computing in IOT
6.Challenge in integration of IoT with Cloud.
7.RFID Vs NFC with real world example
8.Vulnerabilities of IoT
9.Cloud types; IaaS, PaaS, SaaS with real world example
10.Resource Management In The Internet Of Things

List of Home Assignments:

Design:

1. Design a complete IOT architecture for Smart office
2.Design a complete IOT architecture for Smart garden
3.Design a complete IOT architecture for Smart industry
4.Provide a complete layered architecture for Weather monitoring system and explain the same
5.Develop the IOT security system for the applications, just to make sure that the data is collected safely and sound

Case Study:

1.Cloud Computing
2.Temperature Monitoring & Control
3.Various sensors and its internal operation w.r.t raspberry pi-3
4.Smart Campus
5.Cloud Storage models and communication APIs

Blog:

1.Cloud-to-Device Connectivity
2. Industry 4.0- IOT
3. IOT security issues
4. Internet of Business
5. IOT for Healthcare

Surveys:

1. IoT development boards with operating systems
2. Smart Agriculture
3. Rural Development using IOT
4.Smart Supply Chain
5. Smart Transportation

Suggest an assessment Scheme:

1.MSE
2. ESE
3. Course Project
4. GD/PPT

Text Books: (As per IEEE format)

1. ArshdeepBahga, Vijay Madisetti, "Internet of Things – A hands-on approach", Universities Press, 2015
2. Dr. Ovidiu Vermesan, Dr. Peter Friess, "Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems", River Publishers, ISBN-10: 8792982735
3. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.
4. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013

Reference Books: (As per IEEE format)

1.Pethuru Raj, Anupama C. Raman, "The Internet of Things Enabling Technologies, Platforms, and Use Cases", CRC Press Taylor & Francis Group, International Standard Book Number-13: 978-1-4987-6128-4
2. Rajkumar Buyya, Amir Vahid Dastjerdi,"Internet of Things – Principals and Paradigms", Morgan Kaufmann is an imprint of Elsevier, ISBN: 978-0-12-805395-9

3.HakimaChaouchi, " The Internet of Things Connecting Objects to the Web", ISBN : 978-1-84821-140-7, Willy Publications
4. Olivier Hersent, David Boswarthick, Omar Elloumi, "The Internet of Things: Key Applications and Protocols", ISBN: 978-1-119-99435-0, 2nd Edition, Willy Publications
5. Daniel Kellmereit, Daniel Obodovski, "The Silent Intelligence: The Internet of Things", Publisher: Lightning Source Inc; 1stEdition (15 April 2014). ISBN-10: 0989973700, ISBN-13: 978- 0989973700.

Moocs Links and additional reading material:

1. https://nptel.ac.in/courses/106/105/106105166/
2. https://swayam.gov.in/nd1_noc19_cs65/preview

Course Outcomes:

Upon the completion of the course, student will be able to
1) Design an application based on IOT Terminology and Technology
2) Demonstrate embedded tools usage for IOT applications
3) Implement the connectivity technologies and protocols in IOT
4) Produce a solution for IOT security challenges.
5) Apply Cloud technology concepts for developing IOT based prototype
6) Perform programming and data analysis to build and test a complete working IoT system.

CO PO Map:

	Program Outcomes												Program Specific Outcomes			
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO13	PSO14	PSO15	PSO16
CO1	3		3								3				3	
CO2	3	2			3					3		3	2			
CO3	3		2		2											
CO4	2		2	3			3	3	3	3				2		3
CO5	3					2							3			
CO6	2	3												3		3

CO attainment levels:

CO	CO1	CO2	CO3	CO4	CO5	CO6

Level	2	1	3	4	5	5

Future Courses Mapping: Knowledge of IOT can be applied for the development of applications based on AI or ML

Job Mapping:IOT developer ,IOT Embedded software developer, Cloud Engineer, Network Engineer, Can launch startup business

FF No. : 654

IT3211::Engineering Design and Innovation

Course Relevance: Project Centric Learning (PCL) is a powerful tool for students to work in areas of their choice and strengths. Along with course-based projects, curriculum can be enriched with semester long Engineering Design and Development courses, in which students can solve socially relevant problems using various technologies from relevant disciplines. The various socially relevant domains can be like Health care, Agriculture, Defense, Education, Smart City,Smart Energy and Swaccha Bharat Abhiyan. To gain the necessary skills to tackle such projects,students can select relevant online courses and acquire skills from numerous sources under guidance of faculty and enrich their knowledge in the project domain, thereby achieving project centric learning. Modern world sustained and advanced through the successful completion of projects. In short, if students are prepared for success in life, we need to prepare them for a project-based world. It is a style of active learning and inquiry-based learning. Project based learning will also redefine the role of teacher as mentor in the learning process. The PCL model focuses the student on a big open-ended question, challenge, or problem to research and respond to and/or solve. It brings students not only to know, understand and remember rather it takes them to nalyze, design and apply categories of Bloom's Taxonomy.

SECTION-1

Preamble - The content and process mentioned below is the guideline document for the faculties and students to start with. It is not to limit the flexibility of faculty and students;rather they are free to explore their creativity beyond the guideline mentioned herewith. For all courses of ED, laboratory course contents of "Trends in Engineering Technology" are designed as a ladder to extend connectivity of software technologies to solve real world problems using an interdisciplinary approach. The ladder in the form of gradual steps can be seen as below:

Industry Communication Standards, Single Board Computers and IoT, Computational Biology(Biomedical and Bioinformatics), Robotics and Drone, Industry 4.0 (Artificial Intelligence,Human Computer Interfacing, 5G and IoT, Cloud Computing, Big Data and Cyber Securityetc).

Suggest an assessment Scheme:

MSE and ESE

Text Books: (As per IEEE format)

1. A new model of problem-based learning. By Terry Barrett. All Ireland Society for higher education (AISHE).

ISBN:978-0-9935254-6-9; 2017

2. Problem Based Learning. By Mahnazmoallem, woei hung and Nada Dabbagh, Wiley Publishers. 2019.

Stem Project based learning and integrated science, Technology, Engineering and mathematics approach. By

Robert RobartCapraro, Mary Margaret Capraro

Reference Books: (As per IEEE format)

1. De Graaff E, Kolmos A., red.: Management of change: Implementation of problem-based and project-based

learning in engineering. Rotterdam: Sense Publishers. 2007.

2. Project management core textbook, second edition, Indian Edition , by Gopalan.

3. The Art of Agile Development. By James Shore & Shane Warden.

Moocs Links and additional reading material: www.nptelvideos.in

Course Outcomes:

On completion of the course, learner will be able to–

CO1: Identify the real life problem from societal need point of view

CO2: Choose and compare alternative approaches to select most feasible one

CO3: Analyze and synthesize the identified problem from technological perspective

CO4: Design the reliable and scalable solution to meet challenges

CO5: Evaluate the solution based on the criteria specified

CO6: Inculcate long life learning attitude towards the societal problems

CO-PO Map:

	Program Outcomes												Program Specific Outcomes			
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 13	PSO 14	PSO 15	PSO 16
CO1	1	3	3			3								3		

CO2	2			1	2									2	
CO3	3		3		2			3	1				3			
CO4	2	2				3										
CO5	3		3				3		3		3				3	3
CO6	3	2			2					3		3				

B.Tech. Information Technology (applicable w.e.f. AY 20-21)

BTech IT Module -VII (D 20 Pattern)

Subject head	Course code	Course name	Contact hours per week			Credits
			Theory	Lab	Tut	
S1	MD4201	OE1: Engineering and Managerial Economics	2	-	-	2
S2	IT4201	OE2: Design and Analysis of Algorithm	2	-	-	2
S3	IT4211	OE2: Natural Language Processing				
S4	IT4212	OE2: Advanced Communication Engineering				
S5	IT4202	OE3: Computer Vision	2	-	-	2
S6	IT4213	OE3: Deep Learning				
S7	IT4214	OE3: Cloud Computing				
S8	IT4205	Major Project	-	20	-	10

BTech IT Module -VIII (D 20 Pattern)

Subject head	Course code	Course name	Contact hours per week			Credits
			Theory	Lab	Tut	
S1	IT4251	Industry Internship				16
		OR				
S2	IT4252	International Internship				16
		OR				
S3	IT4253	Research Internship				16
		OR				
S4	IT4254	Project Internship				16

FF No. : 654

MD4201:: ENGINEERING AND MANAGERIAL ECONOMICS

Course Prerequisites:

Concepts of various costs, income and expenditure

Course Objectives:

1. To understand the Fundamental EconomicConcepts
2. To understand the techniques of InflationFactor
3. To understand market structure and pricingtheory
4. To understand the concept of depreciation and itseffects
5. To understand cash flowsanalysis

Credits: 2 **Teaching Scheme Theory: 2**Hours/Week

Tut: ..... Hours/Week

Lab..... .. Hours/Week

Course Relevance: Basic knowledge of Economics for working in industry

SECTION-1
Introduction To Economics- Flow In An Economy, Concept Of Engineering Economics – Engineering Efficiency, Revision of concepts like Economic Efficiency, Scope Of Engineering Economics – Element Of Costs, Marginal Revenue, Sunk Cost, Opportunity Cost, Break Even Analysis -P/V Ratio, Elementary EconomicAnalysis **Interest Formulae and Applications** –Time Value Of Money, Single Payment Compound Amount Factor, Single Payment Present Worth Factor, Sinking Fund Factor, Equal Payment Series **Methods Of Comparison Of Alternatives** – Present Worth Method (Revenue Dominated Cash Flow Diagram), Future Worth Method (Revenue Dominated Cash Flow Diagram, Cost Dominated Cash Flow Diagram), Annual Equivalent Method (Revenue Dominated Cash Flow Diagram, Cost Dominated Cash Flow Diagram), Rate Of Return Method, Examples In All TheMethods.

SECTION-1I

Replacement And Maintenance Analysis – Types Of Maintenance, Types Of Replacement Problem, Determination Of Economic Life Of An Asset, Replacement Of An Asset With A New Asset – Capital Recovery With Return And Concept Of Challenger And Defender, Simple Probabilistic Model For Items Which FailCompletely

Depreciation- Introduction, Straight Line Method Of Depreciation, Declining Balance Method Of Depreciation-Sum Of The Years Digits Method Of Depreciation, Sinking Fund Method Of Depreciation/ Annuity Method Of Depreciation, Service Output Method OfDepreciation

Evaluation Of Public Alternatives- Introduction, Examples, Inflation Adjusted Decisions – Procedure To Adjust Inflation, Examples On Comparison Of Alternatives And Determination Of Economic Life Of Asset

List of Tutorials: (Any Three)

1. Currency Fluctuations
2. types of taxes (Direct &Indirect)
3. Numerical onDepreciation
4. Numerical on Discount Rate, Compound Rate,
5. Numerical on Present Worth, FutureWorth,
6. Numerical on AnnualWorth
7. Numerical onAnnuity
8. Numerical onPerpetuity.
9. Numerical on Life Cycle Costing 10.Types ofCompetitions

List of Practicals: (Any Six)

1. Case on effect of Currency Fluctuations on decisionmaking
2. Study of types of taxes applicable to the industry and its impact onprofitability.
3. Numerical onDepreciation
4. Numerical on Discount Rate, Compound Rate,
5. Numerical on Present Worth, FutureWorth,
6. Numerical on AnnualWorth
7. Numerical onAnnuity
8. Numerical onPerpetuity.
9. Numerical on Life Cycle Costing
10. Study of Various Types of Competitions and its applicability to industrialsectors

List of Projects:

1. Currency Fluctuations on decisionmaking
2. Study of types of taxes (Direct & Indirect) applicable to the industry of student's choice and its impact onprofitability.
3. Depreciation
4. Discount Rate, CompoundRate,
5. Present Worth, Future Worth forinvestments
6. Annual Worth
7. Annuity
8. Perpetuity.
9. Life Cycle Costing - Product /Service
10. Study of Various Types of Competitions in any industrialsector.

List of Course Seminar Topics:

1.Element Of Costs
2.Break Even Analysis
3.P/V Ratio
4.Concept Of Challenger And Defender
5.Interest Formulae And Their Applications 6.Types Of Maintenance
7. Declining Balance Method OfDepreciation
8. Effect of Currency Fluctuations on decision making 9.Future Worth forinvestments
10.Determination Of Economic Life Of An Asset

List of Course Group Discussion Topics:

1. Marginal Revenue
2.Opportunity Cost
3.Sunk Cost
4. Time Value OfMoney
5. Replacement Of An Asset With A NewAsset
6. Comparison Of Alternatives And Determination Of Economic Life OfAsset
7. Evaluation Of Public Alternatives duringinflation
8. Types of taxes (Direct & Indirect) and domestic competition
9.Types of taxes (Direct & Indirect) and international competition 10.Procedure To Adjust Inflation - Government'srole

List of Home Assignments:

Design:

1. Design InvestmentPlan
2. Design Replacement Plan for anEquipment
3. Design financial alternatives for workingcapital
4. Design optimum maintenance plan
5. Design life cycle costing for product /service

Case Study:

1. Case study on CurrencyFluctuations
2. Case Study on types of taxes (Direct & Indirect)
3. Case Study onDepreciation
4. Case study on Replacement Of An Asset With A NewAsset
5. Case study on Alternatives And Determination Of Economic Life OfAsset

Blog

1. Currency Fluctuations andhedging
2. Types of Competitions in an industrialsector
3. Alternatives And Determination Of Economic Life OfAsset
4. Future Worth forinvestments
5. Types of taxes (Direct & Indirect) and its impact onprofitability

Surveys

1. Investments
2. EMI
3. Replacement ofcars/mobiles
4. SIP of Mutual Funds
5. Equity MarketsInvestments

Text Books:

1. Panneer Selvam, R, “Engineering Economics”, Prentice Hall Of India Ltd, Second Edition ,New Delhi, 2013

.2 Banga and Sharma, “Industrial Organisation and Engineering Economics”, Khanna Publishers,Twenty Fifth ,2006

Reference Books:

1. Donald.G. Newman, Jerome.P.Lavelle, “Engineering Economics And Analysis” Engg. Press, Texas,2010.

2 Degarmo, E.P., Sullivan, W.G And Canada, J.R, “Engineering Economy”, Macmillan, New York,2011.

3 Zahid A Khan: , “Engineering Economy”, Dorling Kindersley,2012

Moocs Links and additional reading material:www.nptelvideos.in

1. Economics for Engineers - NPTEL course

Course Outcomes:

1. The students will be able to understand the Fundamentals Economics

2. The students will be able to understand effect of Inflation and value ofmoney
3. The students will be able to analyse market situation with respect toeconomics
4. The student will be able to calculate depreciation and itseffects
5. The student will be able to analyse cashflows
6. The student will be able to understand direct and indirecttaxes

CO PO Map
CO 1,2,3,4,5,6 -> PO 1,6,7,8,9,10,11,12

CO attainment levels
CO 1 -3
CO 2 -3
CO 3 -4
CO 4 -4
CO 5 –4

Job Mapping:
Financial Consulting Organisations, Banking

FF No. : 654

IT4201::Design and Analysis of Algorithms

Course Prerequisites: Basic courses on programming, data structures, Discrete structures

Course Objectives:

1. Formulate a given computational problem in an abstract and mathematically precise manner.
2. Choose a suitable paradigm to design an algorithm for given computational problems.
3. Understand asymptotic notations and apply suitable mathematical techniques to find asymptotic time and space complexities of algorithms.
4. Understand notions of NP-hardness and NP-completeness and their relationship with the intractability of decision problems.

Credits: 2 **Teaching Scheme Theory:** 2 Hours/Week

Course Relevance: This is an important course for Information Technology Engineering. which helps to develop algorithmic thinking capability of students. It also facilitates in systematic study of any other domain which demands logical thinking. Designing algorithms using suitable paradigms and analysing the algorithms for computational problems has a high relevance in Industry as well as research. This course is also relevant for students who want to pursue research careers in theory of computing, computational complexity theory, advanced algorithmic research.

SECTION-1

Basic introduction and time and space complexity analysis:

Asymptotic notations (Big Oh, small oh, Big Omega, Theta notations). Best case, average case, and worst-case time and space complexity of algorithms. Overview of searching, sorting algorithms. Using Recurrence relations and Mathematical Induction to get asymptotic bounds on time complexity. Proving correctness of algorithms.

Divide and Conquer: General strategy**,** Binary search and applications, Analyzing Quick sort, Merge sort, Finding a majority element, Order statistics (deterministic algorithms), Josephus

problem using recurrence, Efficient algorithms for Integer arithmetic (Euclid's algorithm, Karatsuba's algorithm for integer multiplication, fast exponentiation).

Dynamic Programming: General strategy, simple dynamic programming based algorithms to compute Fibonacci numbers, Matrix Chain multiplication, Optimal binary search tree (OBST) construction, 0-1 Knapsack, Traveling Salesperson Problem, All pair shortest path algorithm.

SECTION-II

Greedy strategy: General strategy, Analysis and correctness proof of minimum spanning tree and shortest path algorithms, fractional knapsack problem, Huffman coding, conflict free scheduling.

Backtracking strategy: General strategy, n-queen problem, backtracking strategy for some NP-complete problems (e.g. graph coloring, SUDOKU)

Branch and Bound strategy: LIFO Search and FIFO search, Assignment problem

Introduction to complexity classes and NP-completeness: Complexity classes P, NP, coNP, and their interrelation, Notion of polynomial time many one reductions reduction, Notion of NP-hardness and NP-completeness, Cook-Levin theorem and implication to P versus NP question, NP-hardness of halting problem. NP-Complete problems (some selected examples from - vertex cover problem, independent set problem, clique problem, Hamiltonian-circuit problem), reducing NP problems to Integer Linear Programming.

List of Projects:

1. Applications of A* algorithm in gaming
2. Pac-Man game
3. Creation / Solution of Maze (comparing the backtracking based solution and Dijkstra's algorithm)
4. Knight tour algorithms
5. Network flow optimization and maximum matching
6. AI for minesweeper game
7. AI for shooting games
8. AI for Hex, connect-4, sokoban games
9. SUDOKU solver
10. Algorithms for factoring large integers

List of Course Seminar Topics:

1. Complexity classes
2. Divide and Conquer Vs Dynamic Programming
3. Space complexity
4. Greedy strategy Vs Backtracking strategy
5. Dynamic Programming Vs Greedy
6. Computational Complexity
7. Comparison of P Vs NP problems
8. Compression Techniques
9. NP-hardness
10. Real world applications of Graph theoretic algorithms

List of Course Group Discussion Topics:

1. Greedy Algorithms Vs. Dynamic Programming strategy
2. Dynamic Programming Vs Greedy
3. NP-completeness
4. P Vs NP problems
5. Paradigms for algorithm design
6. Different Searching techniques
7. Relevance of Cook-Levin theorem
8. Backtracking strategy
9. Branch and Bound strategy
10. Application of Recursion

List of Home Assignments:

Design:

1. Divide and Conquer strategy for real world problem solving
2. Dynamic Programming strategy for real world problem solving
3. Greedy strategy for real world problem solving
4. Problems on NP completeness
5. Branch and Bound strategy

Case Study:

1. Encoding techniques
2. Network flow optimization algorithms
3. Huffman Encoding, LZW encoding
4. Sorting techniques
5. AKS primality test

Blog:

1. Analysis of P Vs NP Problems and their solutions
2. Study and comparison of Complexity classes
3. Applications of Computational Geometry Algorithms
4. Role of number-theoretic algorithms in cryptography
5. Performance analysis of Graph Theoretic Algorithms

Surveys:

1. Primality Testing Algorithms
2. Integer Factoring Algorithms
3. Shortest Path Algorithms
4. Algorithms for finding Minimum Weight Spanning Tree
5. SAT solvers

Suggest an assessment Scheme:

1. Home Assignment
2. MSE/ESE
3. CVV
4. Seminar
5. Group Discussion

Text Books: (As per IEEE format)

1. Cormen, Leiserson, Rivest and Stein "Introduction to Algorithms" ,PHI 3nd edition, 2009. ISBN 81-203-2141-3

2. Jon Kleinberg, Eva Tardos "Algorithm Design", Pearson, 1st edition, 2005. ISBN 978-81-317-0310-6

3. Dasgupta, Papadimitriu, Vazirani "Algorithms" McGraw-Hill Education; 1st edition (September 13, 2006), ISBN-10: 9780073523408, ISBN-13: 978-0073523408

Reference Books: (As per IEEE format)

1. Motwani, Raghavan "Randomized Algorithms", Cambridge University Press; 1st edition (August 25, 1995), ISBN-10: 0521474655, ISBN-13: 978-0521474658.

2. Vazirani, "Approximation Algorithms", Springer (December 8, 2010), ISBN-10: 3642084699, ISBN-13: 978-3642084690

Moocs Links and additional reading material:www.nptelvideos.in

Course Outcomes:
The student will be able –

1) To formulate computational problems in abstract and mathematically precise manner
2) To design efficient algorithms for computational problems using appropriate algorithmic paradigm
3) To analyze asymptotic complexity of the algorithm for a complex computational problem using suitable mathematical techniques.
4) To differentiate among Complexity classes, and understand their interrelation
5) To establish NP--completeness of some decision problems, grasp the significance of the notion of NP--completeness and its relationship with intractability of the decision problems.
6) To incorporate appropriate data structures, algorithmic paradigms to craft innovative

scientific solutions for complex computing problems.

CO PO Map:

CO	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO13	PSO14	PSO15	PSO16
CO1	3	3		2	3						1	2	2		**3**	
CO2	2		3			2	3	3	3	3	3		3		1	
CO3	3	3												3		
CO4	2	2		3								3				3
CO5	2	2		3					2			3	3	2		
CO6	1	2	3		3	2		2	2	2	2		1		3	3

CO attainment levels:

CO	CO1	CO2	CO3	CO4	CO5	CO6
Level	2	3	4	3	4	4

Future Courses Mapping: Advanced Algorithms, Computational Geometry, Algorithmic Number Theory, Motion planning and Robotics

Job Mapping: Algorithm design is an essential component of any job based on programming. All Industries in IT Engineering always look for a strong knowledge in Algorithm design and Data structures for positions like Developer, Architect, Principal Engineer, Backend lead engineer, Full stack developers, Solution architect, Solution / Senior engineer, Technical lead etc

IT4211: Natural Language Processing

Course Prerequisites:

1. Probability and statistics.
2. Linear Algebra
3. Python programming language

Course Objectives:

1. Learn fundamentals of Text processing
2. Understand the different Language Models
3. Implement POS tagging
4. Implement Text classification
5. Implement sentiment analysis
6. Implement Machine translation

Credits: 2 **Teaching Scheme Theory: 2 Hours/Week**

Course Relevance:

Natural Language Processing is a branch of artificial intelligence that deals with the interaction between computers and humans using the natural language. The common applications of NLP involves, Google translator, Word Processors such as Microsoft, Interactive Voice Response, Personal assistant applications.

SECTION-I
Text Processing: Basics, Empirical Laws, Spelling Correction: Edit Distance, N-Gram Language Models, Basic Smoothing, POS Tagging, Hidden Markov Models for POS Tagging, Viterbi Decoding for HMM and Parameter Learning, Maximum Entropy Models.
SECTION-II

Maximum Entropy Models, Name entity recognition, Syntax, Dependency Grammars and Parsing, Semantic, text classification, sentiment analysis, Machine Translation, Question Answering.
List of Course Seminar Topics: 1. SemEval-2016 task 4: Sentiment analysis in Twitter 2. Modelling user attitudes using hierarchical sentiment-topic model 3. Multilingual dynamic topic model 4. Document-Level Text -classification Using Single-Layer Multisize Filters Convolutional Neural Network 5. Twitter Storytelling Generator Using Latent Dirichlet Allocation and Hidden Markov Model POS-TAG (Part-of-Speech Tagging) 7. Part-of-speech Tagging and Named Entity Recognition Using Improved Hidden Markov Model and Bloom Filter 8. Part of speech tagging for Twitter conversations using Conditional Random Fields model 9. A system for named entity recognition based on local grammars 10. A Maximum-Entropy Segmentation Model for Statistical Machine Translation 11. Mobile embodied conversational agent for task specific applications
List of Course Group Discussion Topics: 1 Smoothing Technique 2. N-gram models 3. POS tagging 4. Ambiguities in NLP 16 5. Challenges in NLP 6. Challenges in designing Language Translators 7. Challenges in designing text classification 8. Challenges in designing sentiment analysis 9. Challenges in designing Question and Answering system 10. Challenges in designing text summarization.
List of Home Assignments: Design:

1. POS tagging using HMM 2. Build Chatbot 3. Summarization of customers reviews 4. Social media Information extraction 5. SMS spam classification Case Study: 1. Hiring and recruitment 2. Advertising 3. Healthcare 4. Market intelligence 5. Sentiment analysis Blog 1. Social media Information extraction 2. Name Prediction in Multiple Languages using Recurrent Neural Networks 3. Text Classification using Sentiment Analysis 4. Image Caption Generator 5. gender identification in Marathi names Surveys 1. POS tagging techniques 2. SMS and email spam classification 3. Categorization of sport articles 4. machine translation Techniques 5. Name entity recognition methods
Suggest an assessment Scheme: 1. Seminar – 10 Marks 2. Group Discussion – 10 Marks 3. Home Assignment – 10 Marks 4. Course Viva – 20 Marks 5. MSE – 15 Marks

6. ESE – 15 Marks

7. Lab work –10 Marks

8. Course project -10 Marks

Text Books: (As per IEEE format)

1. Jurafsky& Martin "Speech and Language Processing" Prentice Hall, 2000

2. Akshar Bharati, Rajeev Sangal and Vineet Chaitanya: "Natural Language Processing: A Paninian Perspective", Prentice-Hall of India, New Delhi, 1995.

Reference Books: (As per IEEE format)

1. Steven Bird, Ewan Klein, and Edward Loper “Natural Language Processing with Python”, O’Reilly Media 2009.

Moocs Links and additional reading material:

1. https://nptel.ac.in/courses/106/105/106105158/

2. https://nptel.ac.in/courses/106/106/106106211/

Course Outcomes:

The student will be able to –

1. Have broad understanding of the field of natural language processing (Co Attainment Level - 3)

2. Get acquainted with the algorithmic description of the main language levels: morphology, syntax, semantics, and pragmatics (Co Attainment level -3)

3. Apply mathematical models and algorithms in applications of NLP. (Co Attainment level - 4)

4. Design and implementation issues in various NLP applications such as information retrieval and information extraction (Co Attainment level - 4)

5 Demonstrate crucial ideas in linguistics (e.g., syntax, semantics, pragmatics), artificial intelligence (e.g., knowledge representation), and machine learning (e.g., deep learning) to natural language processing. (Co Attainment level - 4)

6. Identify one of the contemporary (sub) problems of natural language processing and 19 implement, in the form of a complete computer program as a possible solution to it. (Co Attainment level - 5)

CO-PO Map

CO	Programme Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	2	2	2	1	1	1	1	1		2	3	1	1	1
CO2	3	2	2	2	2	2	1	1	1	1	1	2	2	2	2	2
CO3	3	3	2	3	2	2	1	1	2	2	1	2	2	2	2	2
CO4	3	3	3	3	2	2	2	2	2	2	2	2	2	2	3	3
CO5	3	3	3	3	3	2	2	2	2	2	2	2	2	2	3	2
CO6	3	3	3	3	3	3	2	2	2	2	2	2	2	3	3	2

CO attainment levels

1. CO1 - Level 3
2. C02 - Level 3
3. CO3 - Level 4
4. CO4 - Level 4
5. CO5 - Level 4
6. CO6 - Level 5

Job Mapping:

Natural Language engineers, Data Scientist and Algorithm Architect with industries in domains Media & Entertainment, Healthcare and Finance.

IT 4212: Advanced Communication Engineering

Course Prerequisites:

Communication Engineering, Digital Signal Processing, Wireless Communication

Course Objectives:

1. Analyze the path loss and shadowing effects in wireless communication.
2. Understand diversity techniques of communication.
3. Understand wireless channel modelling.
4. Analyze Orthogonal Frequency Division Multiplexing system.
5. Evaluate the performance of Multiple Input Multiple Output systems.
6. Simulate MIMO receivers

Credits:02 **Teaching Scheme Theory: 02 hours/Week**

Course Relevance:

Future generations of cellular communication require higher data rates and a more reliable transmission link. The transmission data rates can be increase by increasing transmission bandwidth and using higher transmitter power. Wireless communication channels suffer from various factors. Fading problem is the major impairment problem. To improve the performance of those fading channels, diversity techniques are used. Advanced Communication Engineering begins with wireless channel modelling. Also it covers Bit Error Rate performance in fading wireless channel. It covers deep fading issues in wireless communication. Also, it covers how to solve fading problems. It also covers advanced technologies like OFDM (Orthogonal Frequency Division Multiplexing) and MIMO (Multiple Input Multiple Output. An integral part of the course is MATLAB based computer assignments, which are designed to reinforce theoretical concepts.

SECTION-I
Wireless Communication and Diversity Path Loss and Shadowing, Wireless Channel Modelling, Bit Error Rate (BER) performance in Additive White Gaussian Noise (AWGN) communication channel-Analysis, Bit Error Rate (BER) performance in fading wireless channel, Deep fade phenomenon in wireless channels. Diversity in Wireless System Multiple antenna Wireless Systems, optimal receiver combining, Bit Error Rate (BER) performance with diversity, Types of diversity, Deep Fade Analysis with Diversity.

SECTION-II
Orthogonal Frequency Division Multiplexing Multicarrier modulation, Introduction to Orthogonal Frequency Division Multiplexing (OFDM), OFDM system model, IFFT/ FFT Transceiver Model, OFDM -BER and SNR performance, multiuser OFDM. Multiple Input Multiple Output (MIMO) Technology MIMO System model, MIMO- Zero-Forcing (ZF) and Minimum Mean Square Error (MMSE) Receivers, Singular Value Decomposition (SVD), MIMO channel capacity, Optimal water filling power allocation.
List of Course Seminar Topics: 1. Performance analysis of multiple-input multiple-output singular value decomposition 29 transceivers. 2. Modeling the Indoor MIMO Wireless Channel 3. Channel Modelling for 5G mobile Communication 4. Comparison of Indoor Geolocation methods in DSSS and OFDM Wireless Lan Systems 5. Analysis of MIMO system through Zero Forcing and MMSE detection scheme 6. SVD for Engine design of High Throughput MIMO OFDM system 7. Measured capacity gain using water filling in frequency selective MIMO Channels 8. MIMO channel capacity in Co-channel interference. 9. OFDM Channel estimation using Singular value decomposition 10. Increase in capacity of Multiuser OFDM system
List of Course Group Discussion Topics: 1. Fading Environment 2. Deep Fade Phenomenon in Wireless Communication 3. OFDM versus CDMA 4. Filtered -OFDM & OFDM modulation 5. OFDM vs MIMO-OFDM 6. OFDM for Optical Communication 7. MIMO -opportunities and challenges 8. MIMO Radar 9. Massive MIMO for next generation wireless systems

10. 5G - Spectrum, Deployment & Customer Trends
List of Home Assignments: Design: 1. Design of OFDM for UWB environment 2. Design of 4G MIMO OFDM wireless system 3. OFDM for underwater Acoustic communication 4. Design LMSE algorithm for equalization 5. Design Zero forcing Algorithm Case Study: 1. Role of digital communication in digital transformation 2. Digital Communication over fading channels 3. Network coding for wireless Mesh Networks 4. Capacity of wireless communication systems employing antenna arrays 5. MIMO OFDM Blog 1. 5G and Industrial IoT 2. Equalization Techniques for MIMO 3. Diversity Techniques for 4G wireless Communication 4. Massive MIMO 5. Will 5G change the world? Surveys 1. Diversity techniques in Wireless Communication 2. Space time coding scheme for MIMO 31 3. Survey on resource allocation techniques in OFDM (A) networks 4. Survey on Mobile WiMax 5. Performance Analysis in MIMO OFDM system
Suggest an assessment Scheme: 1. Seminar

2. Group Discussion

3. Home Assignment

4. Course Viva

5. MSE

6. ESE

Text Books: (As per IEEE format)

1. Principles of Modern wireless communication systems. Theory and practice , Aditya K. Jagannatham ,McGraw –Hill publication.

2. Wireless Communications-Andrea Goldsmith –Cambridge university press.

3.Wireless Communications- Principle and practice- Theodore S, Rappaport, Pearson.

4. Digital communications -Fundamentals and applications –Bernard Sklar, Prentice Hall

Reference Books: (As per IEEE format)

1. Baseband Receiver Design for wireless MIMO-OFDM communications, Tzi-Dar Chiueh, Pei-Yun Tsai, I-Wei Lai, Wiley-IEEE Press, 2012.

2.Theory and applications of OFDM and CDMA : Wideband Wireless COmmunications , Henrik Schulze, Christian Lueders, Wiley, 2005.

3. Radio Propagation and Adaptive Antennas for Wireless Communication Networks, Nathan Blaunstein, Christos G. Christodoulou, Wiley , 2014.

4. Fundamentals of Wireless Commu

Moocs Links and additional reading material:

www.nptelvideos.in

Advanced 3G, 4G Wireless Mobile Communications

https://nptel.ac.in/courses/117/104/117104099/#

Course Outcomes:

The student will be able to –

1) Calculate received power by system and keep required margin

2) Differentiate between diversity techniques

3) Understand channel modelling

4) Illustrate OFDM System

5) Discuss performance behavior of MIMO systems

6) Differentiate between ZF & MMSE receivers

CO-PO Map

CO	Programme Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	3	1		2								1	1		
CO2	2	3	1		2							1	1	1		
CO3	3	2	1		2					1		2	1	1		
CO4	3	2	1	2	2					1		2	1	1		
CO5	2	2			2				1	1			1	2		
CO6	2	2			2				1	1			1	2		

CO attainment levels

1. CO1 - Level 3
2. C02 - Level 3
3. CO3 - Level 4
4. CO4 - Level 4
5. CO5 - Level 4
6. CO6 - Level 5

Future Courses Mapping:

Mobile Communication

Job Mapping:

Students will have good opportunities in the communication industry as service engineers for operations and maintenance, network planning, software product developer, analytics engineer and so many.

FF No. : 654

IT4202::Computer Vision

Course Prerequisites: Knowledge of Linear Algebra & Different types of Signals, Image Processing

Course Objectives:

1. To introduce the major ideas, methods, and techniques of computer vision
2. To acquaint with Image segmentation and shape representation.
3. To learn pattern recognition.
4. To explore object recognition and its application

Credits: 2 **Teaching Scheme Theory: 2** Hours/Week

Course Relevance: Computer vision is an interdisciplinary scientific field that deals with how computers can gain high-level understanding from digital images or videos. From the perspective of engineering, it seeks to understand and automate tasks that the human visual system can do.

SECTION-1
Image Formation Models : Fundamentals of Image Processing, Monocular imaging system, Radiosity: The 'Physics' of Image Formation, Radiance, Irradiance, BRDF, color etc, Camera model and Camera calibration, Binocular imaging systems, Multiple views geometry, Structure determination, shape from shading, Photometric Stereo, Depth from Defocus, Construction of 3D Model from images. **Image Processing and Feature Extraction**-Image preprocessing, Image representations (continuous and discrete), Edge detection. **Shape Representation and Segmentation** : Classification of Image segmentation techniques: Image Segmentation: Edge Based approaches to segmentation, Gradient using Masks, LOG, DOG, Canny, Edge Linking, Line detectors (Hough Transform), Corners – Harris, Region Growing, Region Splitting, Medial representations, Multiresolution analysis
SECTION-1I

Motion Estimation : Regularization theory , Optical computation , Stereo Vision , Motion estimation , Structure from motion **.**
Object Recognition : Object Recognition { Need, Automated object recognition system, pattern and pattern class, relationship between image processing and object recognition, approaches to object recognition. Hough transforms and other simple object recognition methods, Shape correspondence and shape matching, Principal component analysis, Singular Value Decomposition Shape priors for recognition.
Image Understanding : Pattern recognition methods, HMM, GMM and EM
Applications: Photo album – Face detection – Face recognition.

List of Projects:

1. Image and Video Enhancement models
2. Human Motion Detection
3. Object Detection Model
4. Face Recognition Model
5. Dynamic Texture Synthesis
6. Image and Video Editing
7. Develop an application for a vision-based security system during day/night time. The system should trigger an audio- visual alarm upon unauthorized entry.
8. Develop motion estimation/ tracking system to recognize object of interest related to one of the following applications. (Automobile tracking/ face tracking/ human tracking)

List of Course Seminar Topics:

1. Various Image Segmentation techniques
2. New trends in Face recognitions
3. Applications of Computer Vision for Traffic management
4. Facial Expression recognitions
5. Gesture recognitions using Computer Vision
6. Autonomous Car
7. Usage of Computer Vision in Robotics
8. AR VR using Computer Vision

List of Course Group Discussion Topics:

1. Object Recognitions,
2. 3-D models and its applications,
3. Image Understanding-Pattern Recognition Models,
4. Face detection models,
5. Image Understanding-Pattern Recognition Models,
6. Image Segmentation

List of Home Assignments:

Design:

1. Design 3-D models
2. Face Detection Models
3. Develop an application for a vision-based security system during day/night time. The system should trigger an audio- visual alarm upon unauthorized entry.
4. Develop motion estimation/ tracking system to recognize object of interest related to one of the following applications. (Automobile tracking/ face tracking/ human tracking).
5. Develop motion estimation/ tracking system to recognize object of interest related to one of the following applications. (Space vehicle tracking/ solar energy tracking/ crowd pattern tracking).

Case Study:

1. Computer Vision for Smart City
2. Computer Vision for AR AVR
3. Research Areas in Computer Vision
4. Computer Vision for Swastha Bharat
5. Computer Vision in IoT
6. Computer Vision in Health Analytics
7. Computer Vision in wearable computing

Blog:

1. Computer Vision for Data Science
2. Computer Vision for Smart Agriculture
3. Computer Vision in Medical Field
4. Usage of AI for Computer Vision
5. Job Opportunities in Computer Vision
6. Usage of Image Processing in Computer Vision, Machine Learning, Deep Learning, and AI

Surveys:

1. Computer Vision for Educations
2. Classifications and Recognitions
3. Drone based Surveillance
4. Video Editing
5. Human Motion/Object tracking and detections
6. Computer Vision using High-Performance Computing-Computational
7. Complexity/Time Complexity and Execution time
8. Recent Trends in Computer Vision

Suggest an assessment Scheme:

1. MSE
2. ESE
3. GD
4. PPT
5. Viva etc

Text Books: (As per IEEE format)

1. Richard Szeliski, "Computer Vision: Algorithms and Applications (CVAA)", Springer, 2010.
2. E. R. Davies, "Computer & Machine Vision," Fourth Edition, Academic Press, 2012.
3. Simon J. D. Prince, "Computer Vision: Models, Learning, and Inference", Cambridge University Press, 2012.
4. Rafael Gonzalez & Richard Woods, "Digital Image Processing," 3rd Edition, Pearson publications, ISBN 0132345633.

Reference Books: (As per IEEE format)

1. D. Forsyth and J. Ponce, "Computer Vision - A modern approach," Prentice Hall.
2. E. Trucco and A. Verri, "Introductory Techniques for 3D Computer Vision,"- Publisher: Prentice Hall.
3. D. H. Ballard, C. M. Brown, " Computer Vision", Prentice-Hall, Englewood Cliffs, 1982.

Moocs Links and additional reading material:www.nptelvideos.in

Course Outcomes:
The student will be able –

1. Extract features from Images and do analysis of Images
2. Explore pre-processing algorithms to acquire images
3. Describe shape Representation and Segmentation
4. Apply Supervised and Unsupervised Machine learning for image classification
5. Develop feature descriptor for object detection purpose.
6. Make use of Computer Vision algorithms to solve real-world problems.

CO PO Map:

	Program Outcomes												Program Specific Outcomes			
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 13	PSO 14	PSO 15	PSO 16
CO1	2	3											2			
CO2	2		3		3					3	3					
CO3	2								2					3		
CO4	3				3								3			
CO5	3		3		2		3	3	3	3					3	3
CO6	2	3		3		3						3			3	

CO attainment levels:

CO	CO1	CO2	CO3	CO4	CO5	CO6
Level	1	2	2	3	4	5

Future Courses Mapping:AR VR, NLP,AI, ML, DL, Video Analytics using GPU etc

Job Mapping: Machine Vision Engineer, Associate Data Scientist Computer Vision, Data Scientist-Computer Vision, tensor RT, Keras, Lead Scientist - Image Analytics & Signal

Processing - Deep Learning, Software Development Engineer - Image Processing, Image Processing & Computer Vision Engineer, Architect - Video and Image Processing, Lead - Medical Image Analysis Developer, Research Engineer - Computer Vision, , Image Analysis Scientist - Image Processing/Pattern Recognition.

IT4213: Deep Learning

Course Prerequisites: Linear algebra, probability theory and statistics, Digital signal processing, Computer vision

Course Objectives:

1. To present the mathematical, statistical and computational concepts for stable representations of high-dimensional data, such as images, text

2. To introduce NN and techniques to improve network performance

3. To introduce Convolutional networks

4. To introduce Sequential models of NN

5. To build deep nets with applications to solve real world problem

Credits: 2 **Teaching Scheme Theory: 2 Hours/Week**

Course Relevance: Deep learning is revolutionizing the technology and business world today. It is a subfield of machine learning concerned with algorithms to train computers to perform tasks by exposing neural networks to large amounts of data, its analysis and prediction. It is an incredibly powerful field with capacity to execute feature engineering on its own, uses multiple neural network layers to extract patterns from the data. Top applications of Deep learning involve, self-driving cars, natural language processing, robotics, finance, and healthcare.

Section-I
Topics and Contents Foundations of neural networks and deep learning, Logistic regression as a neural network, different activation function, logistic regression cost function, logistic regression gradient descent, vectorizing logistic regression, forward and backward propagation, Techniques to improve neural networks: regularization and optimizations, hyperparameter tuning, batch normalization, data augmentation, deep learning frameworks, Implementation of neural network for a case study.
Section-II
Convolutional Neural Networks, padding, strided convolution, pooling layers, convolutional implementation of sliding windows, Applications: object classification, object detection, face verification. ResNet, inception networks, bounding boxes, anchor boxes. Sequence modelling: recurrent nets, architecture, vanishing and exploding gradient problem, Applications & use cases.
List of Course Seminar Topics:
1. Deep learning for Stock Market Clustering

2. Application of Deep Networks in health care
3. Credit card fraud detection
4. Classification of skin cancer with deep neural networks
5. ALEXNET
6. VCGNET
7. Accelerating Deep Network Training by Reducing Internal Covariate Shift
8. Deep learning applications for predicting pharmacological properties of drugs
9. GAN (GeneralisedAdversial network)
10. Auto encoders
11. LSTM

List of Course Group Discussion Topics:

1. Recurrent or Recursive Networks for sequential Modelling?
2. Initializing network weights vs performance
3. Difficulty of training deep feedforward neural networks
4. Hyperparameter tuning: Is there a rule of thumb?
5. Problem of overfitting: How to handle?
6 Which cost function: Least squared error or binary cross entropy?
7. How to tackle with loss of corner information in CNN
8. Need of hundred classifiers to solve real world classification problem
9. Which optimization: Batch gradient descent of stochastic gradient descent
10. Activation functions: Comparison of trends
11. Remedy of problem of vanishing gradient and exploding gradient in RNN

List of Home Assignments:

Design:

1. Deep learning for library shelf books identification
2. Development of control system for fruit classification based on convolutional neural networks
3. Classifying movie review using deep learning
4. Sentiment analysis of the demonetization of economy 2016 India
5. Predicting Students Performance in Final Examination

Case Study:

1. Deep learning for security
2. Bag of tricks for efficient text classification
3. Convolutional Neural Networks for Visual Recognition
4. Deep Learning for Natural Language Processing
5. Scalable object detection using deep neural networks

Blog

1. Brain tumor segmentation with deep neural networks
2. Region-based convolutional networks for accurate object detection and segmentation
3. Human pose estimation via deep neural networks
4. Content Based Image Retrieval
5. Visual Perception with Deep Learning
6. Music genre classification system

Surveys:

1. Machine translation using deep learning - survey
2. Shaping future of radiology using deep learning
3. Training Recurrent Neural Networks
4. Text generation with LSTM
5. Deep learning applications in Biomedicine

Suggest an assessment Scheme:

1. Seminar – 10 Marks
2. Group Discussion – 10 Marks
3. Home Assignment – 10 Marks
4. Course Viva – 20 Marks
5. MSE – 25 Marks
6. ESE –25Marks

Text Books: (As per IEEE format)

1. Goodfellow, I., Bengio, Y., and Courville, A., Deeep Learning, MIT Press, 2016.
2. C., M., Pattern Recognition and Machine Learning, Springer, 2006.

Reference Books: (As per IEEE format)

1. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009.

2. Golub, G.,H., and Van Loan,C.,F., Matrix Computations, JHU Press,2013.

3. Satish Kumar, Neural Networks: A Classroom Approach, Tata McGraw-Hill Education, 2004.

Moocs Links and additional reading material:

www.nptelvideos.in 1. https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-cs11 2. https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-cs50

Course Outcomes:

Students will be able to

1) Demonstrate understanding of a logistic regression model, structured as a shallow Neural network

2) Build and train a deep Neural Network

3) Apply techniques to improve neural network performance

4) Demonstrate understanding of functionality of all layers in a convolutional neural network

5) Implement convolutional networks for image recognition/classification tasks

6) Demonstrate Understanding of Recurrent nets and their applications

CO PO Map

CO	Programme Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	4	3	3	2	4	1		1	1	1		2	1	1		
CO2	4	3	3	2	4	2		1	1	1		2	3	3		
CO3	4	3	3	3	4	2		1	1	1		2	3	3		
CO4	4	3	3	3	4	2		1	1	1		2	3	3		
CO5	4	4	3	3	4	2		1	1	1		2	3	3		
CO6	4	4	3	3	4	2		1	1	1		2	3	3		

CO attainment levels

Co1 -Level 3 Co2 - Level 3 Co3 - Level 5 Co4 - Level 4 Co5 - Level 5 Co6 - Level 4
Future Courses Mapping: Advanced course on Deep learning including Autoencoders and Boltzmann machines, Reinforcement Learning etc
Job Mapping: Deep learning engineer, Data Scientist and Algorithm Architect with industries in domains Healthcare, Industrials & Energy, Automobiles, Finance & Insurance, Human Resources, Agriculture, Cybersecurity, Ad & Marketing, Media and Entertainment, Government, Defence

IT4214: Cloud Computing

Course Prerequisites:

Operating Systems, Fundamentals of Computer Networks

Course Objectives:

1. To become familiar with Cloud Computing and its ecosystem
2. To learn basics of virtualization and its importance
3. To evaluate in-depth analysis of Cloud Computing capabilities
4. To give a technical overview of Cloud Programming and Services.
5. To understand security issues in cloud computing

Credits: 2 **Teaching Scheme Theory: 2 Hours/Week**

Course Relevance:

Cloud computing to enable transformation, business development and agility in an organization.

SECTION-I
Introduction to Cloud Computing: Recent trends in Computing, Grid Computing, Cluster Computing, Distributed Computing, Utility Computing, Evolution of cloud computing Cloud Computing Architecture: Cloud versus traditional architecture, Infrastructure as a Service(IaaS), Platform as a Service(PaaS), Software as a Service(SaaS), , Public cloud, Private cloud, Hybrid cloud, Community cloud, Google Cloud architecture, The GCP Console, Understanding projects, Billing in GCP, Install and configure Cloud SDK, Use Cloud Shell, GCP APIs187 111 Infrastructure as a Service (IaaS): Introduction to IaaS, Introduction to virtualization, Different approaches to virtualization, Hypervisors, Machine Image, Virtual Machine(VM), Compute options in the cloud, Exploring IaaS with Compute Engine, Configuring elastic apps with autoscaling, Storage options in the cloud, Structured and unstructured storage in the cloud, unstructured storage using Cloud Storage, SQL managed services, Exploring Cloud SQL, Cloud Spanner as a managed service, NoSQL managed service options, Cloud Datastore, a NoSQL document store, Cloud Bigtable as a NoSQL option

SECTION-II

Platform as a Service (PaaS): Introduction to PaaS, Service Oriented Architecture (SOA). Cloud Platform and Management, Exploring PaaS with App Engine, Event driven programs with Cloud Functions, Containerizing and orchestrating apps with Google Kubernetes Engine Software as a Service (SaaS): Introduction to SaaS, Web services, Web 2.0, Web OS, Service Management in Cloud Computing: Service Level Agreements(SLAs), Billing and accounting, Billing in GCP Cloud Security: Introduction to security in the cloud, the shared security model, Encryption options, Authentication and authorization with Cloud IAM, Identify Best Practices for Authorization using Cloud IAM. Cloud Network : Introduction to networking in the cloud, Defining a Virtual Private Cloud, Public and private IP address basics, Google's network architecture, Routes and firewall rules in the cloud, Multiple VPC networks, Building hybrid clouds using VPNs, interconnecting, and direct peering, Different options for load balancing.

List of Course Seminar Topics:

1. Storage Cost Optimization On Cloud
2. Cloud Security And Cryptography
3. Infrastructure As A Code (IAC)
4. Cloud Computing In Healthcare
5. Serverless Architecture
6. Deployment Of Microservices In Kubernetes Engine
7. RPA Using AWS Cloud
8. Cloud Trends In Supporting Ubiquitous Computing
9. Mobile Cloud Computing
10. Modern Data Center Architecture

List of Course Group Discussion Topics:

1. Data Storage Security in Cloud
2. Cloud Services for SMB's
3. Monitoring Services Provided by GCP and AWS
4. Docker and Kubernetes
5. SaaS vs FaaS (Function as a service)
6. Hybrid Cloud
7. GCP Vs AWS Web Service Architecture

8. Cloud based security issues and threats
9. Authentication and identity 113
10. Future of Cloud-Based Smart Devices

List of Home Assignments:

Design:

1. Serverless Web App to order taxi rides using AWS lambda.
2. Deploying App on Kubernetes
3. Serverless web Application (GCP Cloud Functions)
4. Demonstration of EBS, Snapshot, Volumes
5. Single Node Cluster Implementation (Hadoop)

Case Study:

1. PayU Migration to AWS
2. Cloud object storage
3. Deployment and Configuration options in AWS
4. Deployment and Configuration options in Microsoft Azure
5. Deployment and Configuration options in GCP

Blog

1. Comparing design of various cloud computing platforms
2. AWS EKS and Google Cloud Functions
3. App Engine
4. Cloud Endpoints
5. Cloud Pub/Sub

Surveys

1. Disaster Recovery in Cloud Computing 114
2. Cloud Economics
3. Data archiving solutions
4. Salesforce
5. Dropbox

Suggest an assessment Scheme:

MSE, ESE, GD, Seminar, HA

Text Books: (As per IEEE format)

1. Judith Hurwitz, R.Bloor, M.Kanfman, F.Halper, "Cloud Computing for Dummies", Wiley,India.
2. Ronald Krutz and Russell Dean Vines, "Cloud Security", Wiley-India
3. Gautam Shroff. "Enterprise Cloud Computing", Cambridge

Reference Books: (As per IEEE format)

1. Barrie Sosinsky, "Cloud Computing Bible", Wiley India
2. Antohy T Velte, et.al, "Cloud Computing : A Practical Approach", McGraw Hill.
3. Michael Miller, "Cloud Computing", Que Publishing. 115
4. Tim Malhar, S.Kumaraswammy, S.Latif, "Cloud Security & Privacy", SPD,O'REILLY
5. Scott Granneman, "Google Apps", Pearson

Moocs Links and additional reading material**:**

Course Outcome:

By taking this course, the learner will be able to –

1) Describe the main concepts, key technologies, strengths, and limitations of cloud computing and the possible applications for state-of-the-art cloud computing

2) Explain the architecture and infrastructure of cloud computing, including SaaS, PaaS, IaaS, public cloud, private cloud, hybrid cloud, etc.

3) Identify problems, and explain, analyze, and evaluate various cloud computing solutions.

4) Choose the appropriate technologies, algorithms, and approaches for the related issues.

5) Display new ideas and innovations in cloud computing. 116

6) Collaboratively research and write a paper on the state of the art (and open problems) in cloud computing

CO PO Map:

CO	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO13	PSO14	PSO15	PSO16
CO1	2	3														
CO2	3		3										3			
CO3	2	3					3	3						3		
CO4	3	2		3	3					2		3				
CO5	2	3									1					3
CO6	3			2		3			3	3	3				3	3

CO attainment levels:

CO1-1 CO2-2 CO3-3 CO4-5 CO5-4 CO6-3

Future Courses Mapping: After completing this course different certifications courses in cloud be taken such as AWS, Azure, Google cloud certifications. One can go for higher studies in specialization of cloud computing and allied subjects.

Job Mapping:Cloud Architect, Cloud Engineer, Cloud Administrator, Solutions Architect - Cloud Computing - AWS / Kubernetes, Cloud Computing Technical Consultant, Associate Cloud Computing Engineer, Cloud Computing Trainer

IT4205: Major Project

Credits: 10

Course Relevance:

This is a culmination of four years of learning into Practical. This course is essential for Graduate Engineers to practice the successful management of a software development project. The course emphasizes on project life cycle phases requirement engineering, system analysis and system design and gives them the exposure to research in any area of their interest. A further aim is for students to heighten personal awareness of the importance of developing strategies for themselves and It is a way of increasing the student's maturity and preparing him/her for their future career. The students carry out cutting edge projects with a flexibility to balance between research- and application-oriented work as per their interest. The program enables the students to find opportunities for higher studies in top ranking universities abroad, and to find jobs in dream companies .

The Motivation for this Major Project is

a. Synthesis of knowledge
b. To demonstrate the aptitude of applying the own knowledge to solve a specific problem.
c. To mature the knowledge.
d. Preparation for joining the working world.

The Project Work can lead to:

a. Novice algorithm development
b. Optimization of existing system/method
c. New state of the art application
d. Some incremental work in any existing field of their choice

Overview of the Course:

1. The Student Project Group is expected to make a survey of situation for identifying the requirements of selected Technological Problem. The Student Project Group will be monitored by Internal Guides and External Guides (if any).
2. The project requires the students to conceive, design, implement and operate a mechanism (the design problem). The mechanism may be entirely of the student's own design, or it may incorporate off-the-shelf parts. If the mechanism incorporates off-the-shelf parts, the students must perform appropriate analysis to show that the parts are suitable for their intended purpose in the mechanism.
3. The project must be open-ended – meaning that there is not a known correct answer to the design problem. Students are expected to apply their creativity (simply copying or re-creating something that already exists is not acceptable).
4. The project must have an experimental component. Students must conceive, design, implement and operate an appropriate experiment as part of the project. The experiment might be to collect data about some aspect of the design (i.e., to verify that the design will

work as expected). Alternatively, the experiment could be to verify that the final mechanism performs as expected.

5. Upon receiving the approval, the Student Project Group will prepare a preliminary project report consisting Requirement Definition Document, Feasibility Study Document, System Requirement Specification, System Analysis Document, Preliminary System Design Document. All the documents indicated will have a prescribed format.
6. The Project Work will be assessed jointly by a panel of examiners having more than Five Years experience. The Project Groups will deliver the presentation of the Project Work which will be assessed by the panel.
7. The Student Project Group needs to actively participate in the presentation. The panel of examiners will evaluate the candidate's performance based on presentation skills, questions based on the Project Work, understanding of the Project, analysis and design performed for the project.
8. The Student Project Groups are expected to work on the recommendations given by the panel of examiners. In no case any variation in Project Theme will be permitted.
9. The outcome of the project should be tangible in terms of paper publication/patent/SOP/prototype
10. The Project should justify the work worth 10 credits.

Assessment Scheme

Sr. No.	Content	Marks
1	Development of Prototype/ Model	20
2	Innovativeness and intellectual input	20
3	evaluation of literature review	10
4	Individual contribution	10
5	Usage of Modern Tool/ Technology and experimental competency	10
6	Presentation of the Project Work	10
7	Resultsand analysis	10
8	Quality Publication and Project Report	10

Note:

The student needs to identify a technological problem in the area of Computer Engineering or Information Technology of their choice like signal processing, computer vision, machine learning and artificial intelligence, control systems, game theory, and communication networksand address the problem by formulating a solution for the identified problem. The

project work needs to be undertaken by a group of maximum FOUR and minimum of THREE students. The Project work will be jointly performed by the project team members.
The Project Group will prepare a synopsis of the project work which will be approved by the concerned faculty member. The project should not be a reengineering or reverse engineering project. In some cases, reverse engineering projects will be permissible based on the research component involved in it. The project work aims at solving a real world technical problem. Hence ample literature survey is required to be done by the students. Application-oriented projects will not be acceptable. Low-level custom User Interface development and its allied mapping with a particular technology will not be accepted.
Following is the list of recommended domains for Project Work:
signal processing, computer vision, machine learning and artificial intelligence, IoT, Block Chain, Image Processing, data Science etc.

Course Outcomes:
Upon completion of the course, graduates will be able to -

1. Model the Real World Problem
2. Identify the Design within Specification and Available Resources
3. Realize the Solution within Defined references
4. Defend his Design with Technical and Ethical reasoning
5. Adapt to changing Technological and Human resource advances
6. Use the gained knowledge for other Real-World Problems
7. Project will involve development of a compact solution to current problem/s in chosen field.

CO PO Map:

	Program Outcomes												Program Specific Outcomes			
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO13	PSO14	PSO15	PSO16
CO 1	1	3	3			3								3		
CO 2	2			1	2										2	
CO 3	3		3		2			3	1				3			
CO 4	2	2				3										
CO 5	3		3				3		3		3				3	3

CO 6	3	2			2					3		3				

IT4251: Industry Internship

Credit: 16

Course Relevance: Implementation of technical knowledge acquired during previous three years of Internship and to get acquainted with Industry culture.

SECTION-1

Get used to corporate culture

Realization of Internship as per problem statement

Design, Testing / Experimentation, Analysis / Validation

Documentation and Report Writing

Quality of Work

Performance in Question & Answers Session

Regular interaction with guide

SECTION-2

Problem Statement

Literature Review

Clarity about the objectives of Internship activity

Requirement Analysis, Internship Planning

Knowledge of domain, Latest technology, and modern tools used /to be used

Neat project documentation

Suggest an assessment Scheme:

MSE review for 50 marks converted to 30

ESE review for 100 marks converted to 70

Course Outcomes:

On completion of the course, learner will be able to–

CO1: Explore career alternatives prior to graduation.

CO2: Integrate theory and practice.

CO3: Develop work habits and attitudes necessary for job success.

CO4: Develop communication, interpersonal and other critical skills in the job interview process.

CO5: Acquire employment contacts leading directly to a full-time job following graduation from college.
CO6: Practice Project Management and learn team dynamics

CO PO Map:

CO	Programme Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1					3										
CO2	2	2		2	3	2							3	3	2	2
CO3	3		2				3	3		2						
CO4	3		2					2	3	3						
CO5										3		2				
CO6											3	3				

IT4252: International Internship

Credit: 16

Course Relevance: Implementation of technical knowledge acquired during previous three years of Internship and to inculcate research culture.

SECTION-1

Realization of Internship as per problem statement

Design, Testing / Experimentation, Analysis / Validation

Documentation and Report Writing

Quality of Work

Performance in Question & Answers Session

Regular interaction with guide

SECTION-2

Problem Statement

Literature Review

Clarity about the objectives of Internship activity

Requirement Analysis, Internship Planning

Knowledge of domain, Latest technology, and modern tools used /to be used

Research Paper should be published in Peer Reviewed Journal/Conference or Patent should be published.

Suggest an assessment Scheme:

MSE review for 50 marks converted to 30

ESE review for 100 marks converted to 70

Course Outcomes:

On completion of the course, learner will be able to–

CO1: Explore career alternatives prior to graduation.

CO2: Integrate theory and practice.

CO3: Develop work habits and attitudes necessary for job success.

CO4: Develop communication, interpersonal and other critical skills in the job interview process.

CO5: Acquire employment contacts leading directly to a full-time job following graduation from college.
CO6: Practice Project Management and learn team dynamics

CO PO Map:

CO	Programme Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1					3										
CO2	2	2		2	3	2							3	3	2	2
CO3	3		2				3	3		2						
CO4	3		2					2	3	3						
CO5										3		2				
CO6											3	3				

IT4253: Research Internship

Credit: 16

Course Relevance: Implementation of technical knowledge acquired during previous three years of Internship and to inculcate Industry culture.

SECTION-1

Realization of Internship as per problem statement

Design, Testing / Experimentation, Analysis / Validation

Documentation and Report Writing

Quality of Work

Performance in Question & Answers Session

Regular interaction with guide

SECTION-2

Problem Statement

Literature Review

Clarity about the objectives of Internship activity

Requirement Analysis, Internship Planning

Knowledge of domain, Latest technology, and modern tools used /to be used

Suggest an assessment Scheme:

MSE review for 50 marks converted to 30

ESE review for 100 marks converted to 70

Course Outcomes:

On completion of the course, learner will be able to–

CO1: Explore career alternatives prior to graduation.

CO2: Integrate theory and practice.

CO3: Develop work habits and attitudes necessary for job success.

CO4: Develop communication, interpersonal and other critical skills in the job interview process.

CO5: Acquire employment contacts leading directly to a full-time job following graduation from college.
CO6: Practice Project Management and learn team dynamics

CO PO Map:

CO	Programme Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1					3										
CO2	2	2		2	3	2							3	3	2	2
CO3	3		2				3	3		2						
CO4	3		2					2	3	3						
CO5										3		2				
CO6											3	3				

IT4254: Project Internship

Credit: 16

Course Relevance: Implementation of technical knowledge acquired during previous three years of Internship and to get acquainted with Industry culture.

SECTION-1

Get used to corporate culture and get sponsorship from the company

Realization of Internship as per problem statement

Design, Testing / Experimentation, Analysis / Validation

Documentation and Report Writing

Quality of Work

Performance in Question & Answers Session

Regular interaction with guide

SECTION-2

Problem Statement

Literature Review

Clarity about the objectives of Internship activity

Requirement Analysis, Internship Planning

Knowledge of domain, Latest technology, and modern tools used /to be used

Neat project documentation

Suggest an assessment Scheme:

MSE review for 50 marks converted to 30

ESE review for 100 marks converted to 70

Course Outcomes:

On completion of the course, learner will be able to–

CO1: Explore career alternatives prior to graduation.

CO2: Integrate theory and practice.

CO3: Develop work habits and attitudes necessary for job success.

CO4: Develop communication, interpersonal and other critical skills in the job interview process.

CO5: Acquire employment contacts leading directly to a full-time job following graduation from college.
CO6: Practice Project Management and learn team dynamics

CO PO Map:

CO	Programme Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1					3										
CO2	2	2		2	3	2							3	3	2	2
CO3	3		2				3	3		2						
CO4	3		2					2	3	3						
CO5										3		2				
CO6											3	3				