GOVT. COLLEGE OF ENGINEERING, AMRAVATI

B. TECH. (Information Technology)
V SEMESTER Curriculum
Department of Information Technology
2021-22

GOVERNMENT COLLEGE OFENGINEERING, AMRAVTI.

Department of Information Technology

Scheme for B. Tech. (Information Technology)

SEM V

Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme						Credits
							Theory			Practical			
			Theory Hrs/week	Tutorial Hrs/week	Practical Hrs/week	Total	MSE	TA	ESE	ICA	ESE		
PCC	ITU521	Software Engineering	3	1	-	4	30	10	60	---	---	100	4
PCC	ITU522	Computer Network	3	---	--	3	30	10	60	---	---	100	3
PCC	ITU523	Formal Languages & Automata Theory	3	1	-	4	30	10	60	---	---	100	4
PCC	ITU524	Machine Learning	3		-	3	30	10	60	---	---	100	3
PEC	ITU525	Program Elective- I	3	---	-	3	30	10	60	--	--	100	3
PCC	ITU526	Data Warehousing &Data Mining	3	1	-	4	30	10	60	--	--	100	4
PCC -LC	ITU527	Computer Network Lab	-	---	2	2	---	--	---	25	25	50	1
PCC -LC	ITU528	Machine Learning Lab	-	---	2	2	---	--	---	25	25	50	1
PCC-LC	ITU529	Software Engineering Lab	-	--	2	2	---	--	---	25	25	50	1
PCC-LC	ITU530	Data Warehousing &Data Mining Lab			2	2	--	--	--	25	25	50	1

TA :Teacher Assessment **CT: Class Tests** **ESE: End Semester Examination** **ICA :Internal Continuous Assessment**

Program Elective- I ITU525

A) Information retrieval

B) Parallel Architecture

C) Internet of Things

Government College of Engineering, Amravati

Department of Information Technology

Program Educational Objectives

PEO 1: To formulate, analyze and solve real life problems in software industry, research academia and society at large.

PEO 2: To provide opportunity to learn the latest trends in information technology and prepare for lifelong learning process.

PEO 3: To exhibit strong communication and interpersonal skills, broad knowledge, and global perspectives to work effectively and ethically in multidisciplinary teams.

Program Specific Outcomes

PSO 1: To develop technically sound human resource that shows inclination to pursue IT career in profession, research and higher education.

PSO 2: To exhibit the knowledge of algorithms, data structures /management, software design, information security, programming languages, computer organization and architecture and data science and analytics as a IT professional.

ITU521 SOFTWARE ENGINEERING

Teaching Scheme: 03 L + 01T Total: 04 Credits : 04
Evaluation Scheme: 30 MSE +10 TA+ 60 ESE Total Marks: 100
Duration of ESE: 02 Hrs. 30 min

Course Objectives:
To expose the students to the following:

I. To familiarize students with the principles of software engineering in general. II. Understand efficient techniques for managing systems development lifecycle.
III. To imbibe a correct sense of SE principles and role during development processes.
IV. To inculcate a sense of team-work and team-leadership in a software development team.
V. To gain a better understanding of software development processes in general and to learn different techniques and methodologies for developing large software systems

Introduction: Software Characteristics, Software Engineering: A Layered Technology, Software Process Models, Waterfall Model, Incremental Process Models, Evolutionary Process Models, Agile Process Models

Software Engineering Principles and Practice: Communication Practices, Planning Practices, Requirements Engineering, Case study on feasibility and requirement analysis.

Software Quality Management and Software Testing: Quality concepts, Evolution of Quality Management, Quality assurance, Software Reviews, Testing Fundamentals, Black Box Testing, White Box Testing

Software Project Management: Introduction to Software Project Management, Project Planning, Project Scheduling, Risk Management, Software Teams and Role of Leadership, Case study on project planning and case study on the role of leadership.

Agile Software Development: Introduction to Agile development, Agile Process, Extreme Programming, Agile Process models, Object Oriented Concepts in software engineering, Case study on agile development. **Text Books**:

1. Software Engineering: A Practitioner's Approach , Roger Pressman,TMH ,Sixth Edition
2. Software Engineering , Ian Summerville, Pearson Education, Ninth Edition 3. An integrated approach to Software Engineering, Pankaj Jalote, Springer/Narosa

Reference Books:

1. Schaum's Outline of Software Engineering by David Gustafson (Tata Mc. Hill)
2. Fundamentals of Software Engineering, Rajib Mall, Prentice Hall India
3. Software Project Management ,Sanjay Mohapatra, Cengage Learning India Pvt Ltd

Course Outcomes:

ITU521.1. Considering the general understanding of software engineering from a wider viewpoint.
ITU521.2. Apply methodically the skills learned during the course to actual circumstances of problem understanding and software development.
ITU521.3. Understand the processes of software development as an effective role player.

ITU521.4. Good communication in software development activities.

ITU521.5. Understand the technical and ethical obligation of developing contemporary software and engaging in lifelong learning.

CO-PO-PSO Mapping:

CO	PO / PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ITU521.1	3	2	0	0	2	0	0	0	0	0	0	0	0	3	
ITU521.2	0	2	3	2	0	0	0	0	0	0	0	0	0	3	
ITU521.3	0	1	1	2	2	3	3	2	3	0	0	0	0	3	
ITU521.4	1	0	0	0	0	0	0	0	2	3	2	2	2	2	
ITU521.5	2	0	0	0	0	3	0	1	2	0	2	3	2	2	

0- Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

ITU522 COMPUTER NETWORK

Teaching Scheme : 03 L + 00T Total 03 Credits : 03
Evaluation Scheme: 30MSE+10TA+ 60ESE Total Marks: 100
Duration of ESE: 2Hrs.30min

Course Objectives:

I. To develop an understanding of modern network architectures from a design and performance perspective.

II. To introduce the student to the major concepts involved in wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs). III. To provide an opportunity to do network programming IV. To provide a WLAN measurement ideas.

Data communication Components: Representation of data and its flow Networks , Various Connection Topology, Protocols and Standards, OSI model, Transmission Media, LAN: Wired LAN, Wireless LANs, Connecting LAN and Virtual LAN, Techniques for Bandwidth utilization: Multiplexing - Frequency division, Time division and Wave division, Concepts on spread spectrum.

Data Link Layer and Medium Access Sub Layer: Error Detection and Error Correction - Fundamentals, Block coding, Hamming Distance, CRC; Flow Control and Error control protocols - Stop and Wait, Go back – N ARQ, Selective Repeat ARQ, Sliding Window, Piggybacking, Random Access, Multiple access protocols -Pure ALOHA, Slotted ALOHA, CSMA/CD,CDMA/CA

Network Layer: Switching, Logical addressing – IPV4, IPV6; Address mapping – ARP, RARP, BOOTP and DHCP–Delivery, Forwarding and Unicast Routing protocols.

Transport Layer: Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), SCTP Congestion Control; Quality of Service, QoS improving techniques: Leaky Bucket and Token Bucket algorithm

Application Layer: Domain Name Space (DNS), DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls, Basic concepts of Cryptography

Text Books:

1. Data Communication and Networking, Behrouz A. Forouzan, McGrawHill. 4th Edition.

2. Data and Computer Communication, William Stallings, Pearson Prentice Hall India, 8th Edition.

Reference Books:

1. Computer Networks, Andrew S. Tanenbaum, Pearson New International Edition, 8th Edition.
2. Internetworking with TCP/IP, Douglas Comer, Prentice Hall of India, 6th Edition.
3. TCP/IP Illustrated, W. Richard Stevens, Addison-Wesley, United States of America.

Course Outcomes:

ITU522.1 Interpret the functions of the different layer of the OSI Protocol.

ITU522.2 Draw the functional block diagram of wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs) describe the function of each block.

ITU522.3 Demonstrate design concept for a given requirement (small scale) of wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs) .

ITU522.4 Apply solution to problems related TCP/IP protocol.

ITU522.5 Configure DNS DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls using open source available software and tools.

CO-PO-PSO Mapping:

CO	PO / PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ITU522.1	2	2	0	0	0	0	0	0	0	0	0	0	0	3	1
ITU522.2	2	2	0	0	3	0	0	1	0	0	0	0	0	2	2
ITU522.3	2	3	0	1	3	0	0	0	0	0	0	0	0	3	3
ITU522.4	2	3	2	1	3	2	0	1	0	0	0	0	1	2	2
ITU522.5	3	1	0	0	3	0	0	0	0	0	0	0	0	2	2

0- Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

ITU523 FORMAL LANGUAGES AND AUTOMATA THEORY

Teaching Scheme: 03 L+01T **Total-04** **Credits: 04**

Evaluation Scheme: 30 MSE +10 TA+ 60 ESE **Total Marks: 100**

Duration of ESE: 2hrs.30min.

Course Objectives:

I. Model of Language acceptors like Finite Automata for Regular Language and Push Down Automata for Context Free Language.
II. Understand formal languages like Regular Language and Context Free Language.
III. Interpret Grammar, Languages and their relationships.
IV. Design of Automata as language descriptors and recognizers.

Finite Automata: Alphabet, Language, Operations, Finite state machine, definitions, Finite automation model, Acceptance of strings and languages. Non deterministic finite automation,

deterministic finite automation, equivalence between NFA and DFA, Conversion of NFA into DFA, minimization of FSM, equivalence between two FSM's, Moore and Mealy machines.

Regular expressions: Regular sets, regular expressions, identity rules, Manipulation of regular expressions, equivalence between RE and FA, Inter conversion, pumping lemma, Closure properties of regular sets.

Regular grammars: right linear and left linear grammars, equivalence between regular linear grammar and FA, inter conversion between RE and RG Context free grammar, derivation trees, Chomsky normal form, Greibach normal form, push down automata, definition, model, acceptance of CFL, equivalence of CFL and PDA, interconversion, enumeration of properties of CFL .

Turing machine: Definition, model, design of TM, computable functions, recursive enumerable language, Church's hypothesis, counter machine, types of TM's, Chomsky hierarchy of languages, linear bounded automata and context sensitive language, introduction of DCFL and DPDA, LR (O), grammar, decidability of problems.

Undecidability: properties of recursive & non-recursive enumerable languages, universal Turing machine, post-correspondence problem, introduction to recursive function theory.

Text Books :

1. Introduction to Automata Theory, Languages and Computation , John E. Hopcroft,Rajeev Motwani, Jeffrey D.Ullman ,3rd Edition, Addison-Wesley Publishing Co.,2007.
2. An Introduction to Formal Languages and Automata by Peter Linz,4th Edition, Jones & Bartlett Publication, 2006 .

Reference Books:

1. Introduction to Languages and the Theory of Automata, John C.Martin,2nd Edition, McGraw- Hill Publication, 2003.
2. Elements of Theory of Computation , Lewis H.P. and Papadimition C.H. ,2nd Edition, Prentice Hall Publication, 1997.

Course Outcomes:

ITU523.1. To acquire a full understanding and mentality of Automata Theory as the basis of all computer science languages design.

ITU523.2. Have a clear understanding of the Automata theory concepts such as RE's, DFA's, NFA's, Stack's, Turing machines, and Grammars.

ITU523.3. Design FAs, NFAs, Grammars, languages modeling, small compilers basics.

ITU523.4. Design sample automata. Be able to minimize FA's and Grammars of Context Free Languages.

ITU523.5. Design finite automata to recognize a given regular language. Transform a language into regular expression or finite automata or Transition graph.

CO-PO-PSO Mapping:

CO	PO / PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ITU523.1	3	2	0	0	3	0	0	0	0	0	0	0	0	2	
ITU523.2	2	2	0	0	3	0	0	0	0	0	0	0	0	2	
ITU523.3	2	2	0	0	3	0	0	0	0	0	0	0	0	2	
ITU523.4	2	2	3	0	3	0	0	0	0	0	0	0	0	2	
ITU523.5	2	2	3	0	3	0	0	0	0	0	3	0	0	2	

0- Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

ITU524 MACHINE LEARNING

Teaching Scheme : 03 L + 00T Total 03 Credits : 03
Evaluation Scheme: 30MSE +10TA+ 60ESE Total Marks: 100
Duration of ESE: 2Hrs.30min

Course Objectives:

I. Understanding Human learning aspects.
II. Understanding primitives in learning process by computer.
III. Understanding nature of problems solved with Machine Learning.

Introduction to Machine Learning: Why Machine learning, Examples of Machine Learning Problems, Structure of Learning, Learning versus Designing, Training versus Testing, Characteristics of Machine learning tasks, Predictive and descriptive tasks, Machine learning Models: Geometric Models, Logical Models, Probabilistic Models.

Features: Feature types, Feature Construction and Transformation, Feature Selection.

Classification and Regression Classification: Binary Classification- Assessing Classification performance, Class probability Estimation Assessing class probability Estimates, Multiclass Classification.

Regression: Assessing performance of Regression- Error measures, Overfitting- Catalysts for Overfitting, Case study of Polynomial Regression.

Theory of Generalization: Effective number of hypothesis, Bounding the Growth function, VC Dimensions, Regularization theory.

Linear Models: Least Squares method, Multivariate Linear Regression, Regularized Regression, UsingLeast Square regression for Classification. Perceptron, Support Vector Machines, Soft Margin SVM, Obtaining probabilities from Linear classifiers, Kernel methods for non- Linearity. Logic Based and Algebraic Models

Distance Based Models: Neighbours and Examples, Nearest Neighbours Classification, Distance based clustering-K means Algorithm, Hierarchical clustering, Rule Based Models: Rule learning for subgroup discovery, Association rule mining.

Tree Based Models: Decision Trees, Ranking and Probability estimation Trees, Regression trees, Clustering Trees. Probabilistic Models Normal Distribution and Its Geometric Interpretations, Naïve Bayes Classifier,Discriminative learning with Maximum likelihood, Probabilistic Models with Hiddenvariables: Estimation-Maximization Methods, Gaussian Mixtures, and Compression based Models.

Trends in Machine Learning: Model and Symbols- Bagging and Boosting, Multitask learning, Online learning and Sequence Prediction, Data Streams and Active Learning, Deep Learning, ReinforcementLearning.

Text Books:

1. Machine Learning: The Art and Science of Algorithms that Make Sense of Data, Peter Flach,Cambridge University Press, Edition 2012.
2. Introduction to Statistical Machine Learning with Applications in R, Hastie, Tibshirani, Friedman,Springer, 2nd Edition-2012.

Reference Books:

1. Pattern Recognition and Machine Learning, C. M. Bishop, Springer 1st Edition-2013.
2. Introduction to Machine Learning, EthemAlpaydin, PHI 2nd Edition-2013.

3. Reinforcement and Systematic Machine Learning for Decision Making, Parag Kulkarni ,Wiley IEEE Press, Edition July 2012. **Course Outcomes:**

ITU524.1. Students will be able to model the learning primitives.

ITU524.2. Students will be able to build the learning model.

ITU524.3. Student will be able to tackle real world problems in the domain of Data Mining, Information Retrieval, Computer vision, Linguistics and Bioinformatics.

CO-PO-PSO Mapping:

CO	PO / PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ITU524.1	2	2	0	0	3	0	0	0	0	0	0	0	0	3	
ITU524.2	2	2	1	0	3	0	0	0	0	0	0	0	0	3	
ITU524.3	2	3	3	2	3	2	0	0	0	0	0	0	0	3	

0- Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

PROGRAM ELECTIVE-I ITU525 (A) INFORMATION RETRIEVAL

Teaching Scheme : 03 L + 00T Total 03 Credits : 03
Evaluation Scheme: 30MSE +10TA+ 60ESE Total Marks: 100
Duration of ESE: 2Hrs.30min

Course Objectives:

I. To become familiar with important concepts of Information Retrieval.
II. To learn different indexing techniques to apply data Base systems
III. To understand common text compression algorithms and their role in the efficient building and storage of inverted indices.
IV. To understand how statistical models of text can be used to solve problems in Information Retrieval.

Introduction to Information Retrieval: Information Retrieval, History of Information Retrieval, Information Retrieval vs Data Retrieval, Inverted index and Boolean queries. Nature of unstructured and semi structured text.

Retrieval Evaluation: Recall and Precision, Alternative Measures, Reference Collections and Evaluation of IR systems. Query Languages for IR: Keywords, Boolean Queries, Context Queries, Natural Language Queries, Structural Queries.

Text Indexing and Text Searching: tokenization, stop words, stemming, thesauri, index optimization. Text statistics (properties), Text compression. Knuth-Morris-Pratt, BoyerMoore family, Suffix automaton, Phrases and Proximity.

Retrieval Model : Boolean, vector space, TFIDF, Okapi, probabitistic, language modeling, latent semantic indexing, Vector space scoring, the cosine measure, Efficiency considerations. Document length normalization. Relevance feedback and query expansion. **Text Categorization and Filtering:** Introduction to text classification. Naïve Bayes models. Spam filtering. Vector space classification using hyperplanes; centroids; k Nearest Neighbors. Support vector machine classifiers. Kernel functions. Boosting.

Text Clustering: Clustering versus classification. Partitioning methods. Mixture of Gaussians model. Hierarchical agglomerative clustering. Clustering terms using documents.

Text Book:

1. An Introduction to Information Retrieval, C. D. Manning, P. Raghavan H. Schutze Cambridge University Press, 2009.
2. Search Engines: Information Retrieval in Practice, B. Croft, D. Metzler, T. Strohman (2010), Pearson Education.

Reference Book:

1. Modern Information Retrieval R. Baeza-Yates and B. Ribeiro-Neto Pearson Education, 1999

Useful link:

1.https://nptel.ac.in/courses/106/101/106101007/

2.https://slideplayer.com/slide/10878555/ IIT Kharagpur

Course Outcomes:

ITU525(A).1. Student will understanding the basic concept and techniques in Information Retrieval

ITU525(A).2. Student will be able to apply Information Retrieval principles to locate relevant information from collections of data

ITU525(A).3. Student will be able to implement different Retrieval Models like Boolean model, vector space model

ITU525(A).4. Student will design document clustering and Text classification methods.

CO-PO-PSO Mapping:

CO	PO / PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ITU525(A).1	3	0	0	0	0	0	0	0	0	0	0	0	2	0	
ITU525(A).2	0	0	3	0	0	0	0	0	0	0	0	0	0	0	
ITU525(A).3	0	3	0	0	3	0	0	0	0	0	0	0	0	0	
ITU525(A).4	0	0	0	3	0	0	0	0	0	2	0	0	0-	3	

0- Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

ITU525 (B) PARALLEL ARCHITECTURE

Teaching Scheme: 03 L + 00T **Credits: 03**

Evaluation Scheme: 30 MSE +10 TA+ 60 ESE **Total Marks: 100**

Duration of ESE: 02 Hrs. 30 min

Course Objectives:

I. To train students to design and evaluate parallel architectures/systems for scientific/engineering/enterprise application domains.

II. Will be covering the main architectural components in a parallel computer, including midrange SMPs, high-performance scalable distributed memory machines, and parallel single-chip designs

III. The programming models deployed on parallel machine and automatically parallelizing compilers.

IV. Recent emerging trends and ideas in parallel machine designs on a single-chip, proposed for billion transistor multiprocessor-on-a-chip architectures, are also discussed, including

coarse-grained chip-multiprocessors, fine-grained reconfigurable tiled designs, as well as speculative parallel architectures.

Introduction to Parallel and Pipeline Processing: Evolution of Computer Systems, Necessity of high performance, Constraints of conventional architecture .Parallelism in Uniprocessor Systems, Instruction level Parallelism and Thread Level Parallelism. Evolution of Parallel processors, Parallel Computer Structures, Future Trends. Processor - Architectural Classification Schemes Memory Subsystems in parallel environment. Hierarchical Memory Structure: Interleaved memory - structure, performance.Virtual Memory - utilisation, locality of reference, performance. Cache Memory - structure, performance, implementation, optimisation I/O and secondary storage. I/O techniques- polling, interrupts, direct memory access.

I/O channels, I/O processors: Structures, bandwidth issues Pipelining and Vector Processing Pipelining : An Overlapped Parallelism, Principles and implementation of Pipelining. Classification of pipelining processors. Study and comparison of processors with and without pipelining. General pipelining reservation table. Instruction and Arithmetic Pipelining : Design Aspects

Principles of Designing Pipelined Processors: Pipelining hazards and resolving techniques, Data buffering techniques, Job sequencing and Collision detection. Data level parallelism:Vector processing. Superscalar Architecture. SIMD Computer Organization. SIMD Array Processors: Masking and Data network mechanism, Inter PE Communication . Communication: SIMD Interconnection networks, Static Vs Dynamic Network, Cube, hyper cube, Mesh Interconnection Network. Associative Array Processors. Parallel Algorithms for Array Processors: Matrix Multiplication algorithm, Sorting algorithm and their analysis.
Performance Enhancement Methods of SIMD Array Processors Multiprocessor and Multicore Architectures. Functional Structures:Loosely and Tightly coupled multiprocessors, Processor characteristics of multiprocessors. Interconnection Networks: Time shared bus, Crossbar switch, Multiport Memory Model, Memory contention and arbitration techniques, Cache coherency. Parallel Memory Organizations for multiprocessors.

Exploiting Concurrency for Multiprocessing : Implementation issues of a program on multiprocessor system, critical sections, semaphores, monitor, producer-consumer problem. Deadlocks: prevention, avoidance, detection. Parallel Algorithms for Multiprocessors, Parallel Programming Languages: Fortran 90. Multicore systems: Structure, performance, complexity, power consumption, memory utilization g. GPU based Architecture, CPU-GPU integration.

Text Books:

1 Computer Architecture: A Quantitative Approach (Third Edition), John Hennessy and David Patterson, Morgan Kaufmann Publishers, 2003.
2 Computer Architecture and Parallel Processing, Kai Hwang, Faye A. Briggs, McGrawHill international Edition.
3 Parallel Computer Architecture, D. E. Culler and J. P. Singh with A. Gupta,Morgan-Kaufmann publishers.

Reference Books:

1 Parallel Computers, V.Rajaraman, L Sivaram Murthy, PHI.
2 Scalable Parallel Computing, Kai Hwang.
3 High performance computer Architecture, Harrold Stone.

4 Advanced Computer Architecture, Richard Y. Kain.

5 Advanced Computer Architecture, Kai Hwang,Tata McGraw-Hil **Course Outcomes:**

ITU525(B).1. Understand the critical methods and techniques related to parallel computing.

ITU525(B).2. The students will have a deep understanding of how parallel systems are designed and what are the fundamental methods to program and analyze them.

ITU525(B).3. Understand the components and operation of a memory hierarchy & I/O and the performance issues influencing its design.

ITU525(B).4. Explain how large_scale parallel systems are architecture and how massive parallelism are implemented in accelerator architectures.

ITU525(B).5. Write parallel programs for large_scale parallel systems, shared address space platforms, and heterogeneous platforms.

CO-PO-PSO Mapping:

CO	PO / PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ITU525(B).1	3	2	0	0	2	0	3	0	0	0	0	0	0	3	
ITU525(B).2	0	2	3	2	0	0	0	0	0	0	0	0	0	3	
ITU525(B).3	0	1	1	2	2	3	3	2	3	0	0	0	0	3	
ITU525(B).4	1	0	0	0	0	0	0	0	2	3	2	2	2	2	
ITU525(B).5	2	0	0	0	0	3	0	1	2	0	2	3	2	2	

0- Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

ITU525 (C) INTERNET OF THINGS

Teaching Scheme : 03 L + 00T Total 03 Credits : 03

Evaluation Scheme: 30MSE +10TA+ 60ESE Total Marks: 100

Duration of ESE: 2Hrs.30min

Course Objectives:

I. To understand the structure, function and characteristics of computer systems.

II. To understand the design of the various functional units and components of computers.

III. To identify the elements of modern instructions sets and their impact on processor design.

IV. To explain the function of each element of a memory hierarchy, V. To identify and compare different methods for computer I/O.

Introduction to IoT: Overview of Internet of Things, building blocks of IoT, characteristics of IoT systems and IoT levels. IoT and M2M, IoT design methodology, Technology Considerations- IoT Problem Statement, IoT , Technology Enablers, IoT Technology Stack, IoT, Data Considerations, IoT Projects, Introduction to Complexity, IoT Challenges, future of IoT, Applications of IoT, Advantages of IoT.

Retail, Healthcare & Agriculture, IoT Architecture: Reference Architecture, Study and usage of various types of sensors and actuators, IoT devices, gateways

IoT Physical Devices & Endpoints: Microprocessor, Microcontroller, Microcomputer hardware and software concepts. Study and usage of Prototyping boards like, Arduino, Intel

edison, raspberry pi etc. (from software and hardware perspective) programming using sketches and python. Other programming languages used for IoT. A generic design methodology for Internet of Things

Communication: Introduction to communication architecture- Network protocol stack, Different protocols: RF: ZigBee, Blue Tooth, BLE, Zwave, Mesh network. Communication Channels: GSM/GPRS, 2G, 3G, LTE, WiFi , IoT protocols: MQTT/MQTTS, CoAP, 6LoWPAN, like TCP, UDP, HTTP/S., Comparison of the different IoT protocols,

Application issues with RF protocol - power consumption, LOS, reliability. Security aspects. Showcase the GSM module, Cloud platform and framework for developing IoT: An introduction to the use of cloud platforms and frameworks for developing IoT applications. Data Analytics for IoTCloud.

Text Books:

1. Internet of Things: A Hands-on Approach, ArshdeepBahga, Vijay Madisetti, Universities Press, 2015.

Reference Books:

1. Getting Started with Intel Edison, Stephanie Moyerman,Published by Maker Media, Inc., San Francisco, 2016. CA 94111.
2. Internet of Things (A Hands-onApproach), Vijay Madisetti and ArshdeepBahga, 1st Edition, VPT, 2014

Supplementary Resources: References Web

a)https://www.udemy.com/internet-of-things-iot-for-beginners-getting-started/
b)http://playground.arduino.cc/Projects/Ideas
c) http://runtimeprojects.com
d)http://www.megunolink.com/articles/arduino-garage-door-opener
e) http://www.willward1.com/arduino-wifi-tutorial
f)http://www.makeuseof.com/tag/pi-overdose-heres-5-raspberry-pi-alternatives
g) http://www.electronicshub.org/arduino-project-ideas
h) http://homeautomationserver.com
i) http://www.toptechboy.com/arduino-lessons
j)https://www.eprolabs.com

YouTube

b)https://www.youtube.com/watch?v=kLd_JyvKV4Y
c) https://www.youtube.com/watch?v=TkA2LJctU1c **Course**

Outcomes:

On completion of the course, student will be able to:

ITU525 (C).1 Understand general concepts of Internet of Things (IoT)
ITU525 (C).2 Recognize various devices, sensors and applications
ITU525 (C).3 Apply design concept to IoT solutions
ITU525 (C).4 Analyze various M2M and IoT architectures
ITU525 (C).5 Evaluate design issues in IoT applications

CO-PO-PSO Mapping:

CO	PO / PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ITU525(C).1	3	0	0	0	0	2	0	0	0	0	0	0	1	2	

ITU525(C).2	1	2	0	0	0	1	0	0	0	0	0	0	3	3	
ITU525(C).3	1	0	3	0	2	0	0	0	0	0	0	0	2	3	
ITU525(C).4	0	3	0	0	3	3	0	0	0	0	0	0	1	2	
ITU525(C).5	0	2	0	0	0	2	0	3	0	0	0	0	2	2	

0- Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

ITU526 DATA WAREHOUSING AND DATA MINING

Teaching Scheme: 03 L+ 01T Total: 04 Credits: 04 Evaluation Scheme: 30 MSE +10 TA+ 60 ESE Total Marks: 100 Duration of ESE: 2hrs.30min.

Course Objectives:

I. This course will introduce the concepts, techniques, design and applications of data warehousing and data mining.
II. Some systems for data warehousing and/or data mining will also be introduced.
III. The course is expected to enable students to understand and implement classical algorithms in data mining and data warehousing.
IV. Students will learn how to analyze the data, identify the problems, and choose the relevant algorithms to apply.
V. Then, they will be able to assess the strengths and weaknesses of the algorithms and analyze their behavior on real datasets.

Data ware house and OLAP Technology for data mining: Data ware house, multidimensional data model, data ware house architecture, data warehouse storage, data ware house implementation.

Data mining: Data mining functions, classification and major issues. Data Preprocessing Data cleaning, data integration and transformation, data reduction, discrimination & concept hierarchy generation.

Data mining primitives: Concept, Data mining query language. Concept description: data generalization, Analytical characterization, mining class comparison.

Data Mining Functions: Mining frequent patterns, Market Basket Analysis, Frequent Pattern Mining, The Apriori Algorithm ,Introduction to Classification and prediction, Issues regarding classification and prediction, Classification by decision tree induction, Bayesian classification, Introduction to cluster analysis, types of data in clustering analysis, a categorization of major clustering methods, partitioning methods, hierarchical methods, outlier analysis.

Application and Advances in data mining: Data mining applications, Social Network Analysis, Text Mining.

Text Books:

1. Data Mining Concepts and Technique's, Han and M.Kamber, 1st edition, Elsevier Pub. Indian Reprint, 2004.
2. Data Ware Housing, Data Mining and OLAP, Berson, 2nd Edition, Tata McGraw- Hill, 2004.

Reference Books:

1. The Data Ware House Life Cycle Tool Kit, R. Kimball , 1st Edition, Wiley Press, John Wiley and Sons (ASIA) Pvt. Ltd,2001.
2. Data Mining Techniques, Arun K. Pujari, 2nd Edition, University Press (Orient Longman), 2003.

Course Outcomes:

ITU526.1. Identify and apply the data warehouse and OLAP technology for data mining.
ITU526.2. Understand the data preprocessing issues and data mining functions.
ITU526.3. Analyze different data mining primitives for the functions.
ITU526.4. Implement the different algorithms of classification and prediction.
ITU526.5. Implement the different algorithms for data clustering.

CO-PO-PSO Mapping:

CO	PO / PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ITU526.1	3	2	0	0	3	0	0	0	0	0	0	0	0	2	
ITU526.2	2	2	0	0	3	0	0	0	0	0	0	0	0	2	
ITU526.3	2	2	0	2	3	0	0	0	0	0	0	0	0	2	
ITU526.4	2	2	2	2	3	0	0	0	0	0	0	0	0	2	
ITU526.5	2	2	3	2	3	0	0	0	0	0	3	0	0	2	

0- Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

ITU527 COMPUTER NETWORK LAB

Teaching Scheme : 02 P **Total 02** **Credit : 01**
Evaluation Scheme: 25 ICA+25ESE **Total Marks: 50**
Duration of ESE : 3Hrs.

Course Objectives:

I. Students will be able to use simulation tools
II. Student will be able to understand the various protocols
III. Students will be able to implement the various protocols
IV. Student will be able to analyze various routing algorithms.

Minimum Eight Experiments to be performed to achieve course outcomes.

It is a representative list of practical/exercises. The instructor may choose experiments to fulfill the course outcomes.

List of Experiments

1. Implementation of Stop and Wait Protocol and Window Protocol.
2. Study of Socket Programming and Client – Server model.
3. Write a code for simulating ARP /RARP protocols.
4. Write a code for simulating PING and TRACE ROUTE commands.
5. Create a socket for HTTP for web page upload and download. 6. Write a program to implement RPC (Remote Procedure Call)
7. Implementation of Subnetting.
8. Applications using TCP Sockets like
   A. Echo client and echo server

B. Chat

C. File Transfer

9. Applications using TCP and UDP Sockets like
   A. DNS
   B. SNMP
   C. File Transfer
10. Perform a case study about the different routing algorithms to select the network path with its optimum and economical during data transfer.
    A. Link State routing
    B. Flooding
    C. Distance vector
11. Study of Implementation Internet Services by telnet, ssh, ftp, scp utilities.
12. Study of Network simulator (NS) and Simulation of Congestion Control Algorithms using NS.

ICA – The Internal Continuous Assessment shall be based on practical record and knowledge or skills acquired. The performance shall be assessed experiment wise by using continuous assessment format, A & B.

ESE- The End Semester Exam for Practical shall be based on performance in one of the experiments and may be followed by sample questions.

Course Outcomes:

Students will be able to:

ITU527.1. Use simulation tools

ITU527.2. Understand the various protocols

ITU527.3. Implement the various protocols **ITU527.4.**

Analyze various routing algorithms **CO-PO-PSO**

Mapping:

CO	PO / PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ITU527.1	3	2	0	0	2	0	0	0	0	0	0	0	0	2	
ITU527.2	2	2	0	0	2	0	0	0	0	0	0	0	0	2	
ITU527.3	2	2	0	0	3	0	0	0	0	0	0	0	0	2	
ITU527.4	2	2	0	0	3	0	0	0	0	0	0	0	0	2	

0- Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

ITU528 MACHINE LAERNING LAB

Teaching Scheme : 02 P **Total 02** **Credit : 01**

Evaluation Scheme: 25 ICA+25ESE **Total Marks: 50**

Duration of ESE : 3Hrs.

Course Objectives:

I. Use of Data sets in implementing the machine learning algorithms II. Understand and Apply the machine learning concepts and algorithms.

Minimum Eight Experiments to be performed to achieve course outcomes.

It is a representative list of practical/exercises. The instructor may choose experiments to fulfill the course outcomes.

List of Experiments:

1. Introduction to various datasets provided with sklearn and keras : Structured Vs unstructured data, iris dataset, olivetti faces dataset, MNIST dataset, CIFAR-10 dataset and <any other datasets being used in the labs> , Feature extraction, using sklearn for train-test split, standardization and normalization
2. Implementation of Linear regression.
3. Implementation of Logistic regression.
4. Write a program to implement k-Nearest Neighbor algorithm to classify the object. Use an appropriate data set for classification.
5. Write a program to implement the naïve Bayesian classifier for a sample training data set.
6. Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data set.
7. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set.
8. Write a program to calculate the distance between objects using any one distance calculation method.
9. Write a program to implement K-Means algorithm. Use an appropriate data set for clustering.
10. Implementation of SVM(Weather forecasting/Image segmentation etc)
11. Write a program for association rule mining.
12. Write a program to calculate the Information Gain (for Decision Tree Induction).
13. Implementation of Rule-Based Classification.
14. Students have to try for ongoing competitions on the websites like Kaggle and submit the report(e.g. this project https://www.kaggle.com/c/digit-recognizer/overview)

Software: Students have to use any open source software like R/Python, TensorFlow, Scikitlearn for implementation of above practical

ICA – The Internal Continuous Assessment shall be based on practical record and knowledge or skills acquired. The performance shall be assessed experiment wise by using continuous assessment format, A & B.

ESE- The End Semester Exam for Practical shall be based on performance in one of the experiments and may be followed by sample questions.

Course outcomes:

The students should be able to:

ITU528.1 Understand Machine Learning concepts in solving problems of regression, clustering, classification and SVMs nature

ITU528.2 Understand the use of various open-source/free-to-use global datasets being used for Machine Learning concepts and its implementation.

ITU528.3 Identify and understand the areas /domains in which Machine Learning can be utilized as a solution finding process.

ITU528.4 Apply appropriate Machine Learning algorithms in tackling real life problems.

CO-PO-PSO Mapping:

CO	PO / PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ITU528.1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	
ITU528.2	0	3	0	0	3	0	0	0	0	0	0	0	0	0	
ITU528.3	0	0	3	0	3	0	0	0	0	0	0	2	2	0	
ITU528.4	0	0	0	0	3	0	0	0	0	0	0	0	0	3	

0- Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

ITU529 SOFTWARE ENGINEERING LAB

Teaching Scheme: 02 P **Total: 02** **Credit: 01**
Evaluation Scheme: 25 ICA + 25 ESE **Total Marks: 50**
Duration of ESE: 3hrs.

Course Objectives:

I. To study object oriented analysis features.
II. To study CASE tools
III. To study the design of test cases
IV. To study the understanding of agile techniques

Minimum Eight Experiments to be performed to achieve course outcomes.

It is a representative list of practical/exercises. The instructor may choose experiments to fulfill the course outcomes.

List of Experiments:

1. Draw one or more Use Case diagrams for capturing and representing requirements of the system. Use case diagrams must include template showing description and steps of the Use Case for various scenarios.

2A. Draw Package diagram to organize and manage your large and complex systems as well as their complex models.

OR

2B. Draw activity diagrams to display either business flows or like flow charts.

3A. Draw basic class diagrams to identify and describe key concepts like classes, types in your system and their relationships. OR

3B. Draw advanced class diagrams to depict advanced relationships and interfaces.

4A. Draw sequence diagrams OR

4B. Communication diagrams with advanced notation for your system to show objects and their message exchanges.

5A. Draw component diagrams assuming that you will build your system reusing existing components along with a few new ones. OR

5B. Draw deployment diagrams to model the runtime architecture of your system.

6. Case study and use of appropriate CASE tools in Software engineering.
7. Case study and use of program analysis tools in the software life cycle.
8. Case study and use of test case design in software development.

9. Case study of Agile development scenario of software development.
10. Mini-project on a brief problem statement (to be decided by students)

ICA – The Internal Continuous Assessment shall be based on practical record and knowledge or skills acquired. The performance shall be assessed experiment wise by using continuous assessment format, A & B.

ESE- The End Semester Exam for Practical shall be based on performance in one of the experiments and may be followed by sample questions.

Course Outcomes:

ITU529.1. Able to create object oriented analysis features in SE program development
ITU529.2. Apply CASE tools for SE scenario
ITU529.3. Understand to implement program analysis tools in SELife Cycle
ITU529.4. Able to develop test cases for effective software development **CO-PO-PSO Mapping:**

CO	PO / PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ITU529.1	1	2	3	2	0	0	0	0	0	0	0	0	2	2	
ITU529.2	0	0	0	2	3	0	1	0	0	0	1	0	2	2	
ITU529.3	2	1	2	2	3	0	0	0	0	0	1	0	1	2	
ITU529.4	0	0	2	1	2	1	0	0	1	0	1	2	2	3	

0- Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

ITU530 DATA WAREHOUSING AND DATA MINING LAB

Teaching Scheme: 02 P Total: 02 Credit: 01 Evaluation Scheme: 25 ICA + 25 ESE Total Marks: 50
Duration of ESE: 3hrs.

Course Objectives:

I. This course will introduce the concepts, techniques, design and applications of data warehousing and data mining.
II. Some systems for data warehousing and/or data mining will also be introduced.
III. The course is expected to enable students to understand and implement classical algorithms in data mining and data warehousing.
IV. Students will learn how to analyze the data, identify the problems, and choose the relevant algorithms to apply.
V. Then, they will be able to assess the strengths and weaknesses of the algorithms and analyze their behavior on real datasets.

Minimum Eight Experiments to be performed to achieve course outcomes.

It is a representative list of practical/exercises. The instructor may choose experiments to fulfill the course outcomes.

List of Experiments:

1. Implementation of Binning Methods for DATA SMOOTHING
2. Implementation of MIN/MAX normalization and Z-SCORE normalization.

3. Write a program for finding MEAN and MEDIAN of the given Data Set.
   DATA SET-(4,8,9,15,21,21,24,25,26,28,29,34)
4. Generate/Prepare HISTOGRAMS for given data using STATISTICA/WEKA software.
   DATA SET-(1,1,5,5,5,5,5,8,8,10,10,10,12,14,14,14,15, 15, 15, 15, 15, 15,18, 18, 18, 18, 18, 18, 18,20, 20, 20, 20, 20, 20, 20,25, 25, 25, 25, 25,28,28,30,30,30)
5. Prepare Regression Analysis of User Data Set using STATISTICA software.(linear &non linear)
6. Implement the STAR Schema of a DATAWAREHOUSE for Sales (Consider one example).
7. Implementation of any one algorithm of Clustering.
8. Prepare Correlation analysis using CHI-SQUARE method in STATISTICA software using given Data set
9. Write a program for calculating Term Frequency and Inverse Document Frequency for given table.
10. Write a program for predicting a class Label using any one algorithm of Classification for a given data set

ICA – The Internal Continuous Assessment shall be based on practical record and knowledge or skills acquired. The performance shall be assessed experiment wise by using continuous assessment format, A & B.

ESE- The End Semester Exam for Practical shall be based on performance in one of the experiments and may be followed by sample questions.

Course Outcomes:

ITU530.1. Identify the data warehouse and OLAP technology for data mining.
ITU530.2. Identify the data preprocessing issues, data mining functions.
ITU530.3. Analyze different data mining primitives for the functions.
ITU530.4. Implement the different algorithms for classification and prediction.

CO-PO-PSO Mapping:

CO	PO / PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ITU530.1	3	2	0	0	2	0	0	0	0	0	0	0	0	2	
ITU530.2	2	2	0	0	2	0	0	0	0	0	0	0	0	2	
ITU530.3	2	2	3	3	3	0	0	0	0	0	0	0	0	2	
ITU530.4	2	2	3	3	3	0	0	0	0	0	0	0	0	2	

0- Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated