# SYLLABUS
(With effect from 2014-2015)

# ಪಠ್ಯಕ್ರಮ
ಶೈಕ್ಷಣಿಕ ವರ್ಷ ೨೦೧೪-೨೦೧೫ ರಿಂದ

## Master of Technology in
# COMPUTER SCIENCE AND ENGINEERING


**Visvesvaraya Technological University**
"Jnana Sangama", Belgaum - 590 018, Karnataka.
**ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ**
"ಜ್ಞಾನ ಸಂಗಮ", ಬೆಳಗಾವಿ ೫೯೦ ೦೧೮, ಕರ್ನಾಟಕ

# Syllabus of I to IV Semesters

(With effect from 2014-2015)

Master of Technology in

# COMPUTER SCIENCE AND ENGINEERING

**Visvesvaraya Technological University, Belgaum**

ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಬೆಳಗಾವಿ

Web: www.vtu.ac.in

## VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI
## SCHEME OF TEACHING AND EXAMINATION FOR
## M.Tech. in Computer Science and Engineering

**III Semester: INTERNSHIP**

**CREDIT BASED**

| Course Code | Subject | No. of Hrs./Week | | Duration of the Exam in Hours | Marks for | | Total Marks | CREDITS |
|---|---|---|---|---|---|---|---|---|
| | | Lecture | Practical / Field Work | | I.A. | Exam | | |
| 14SCS31 | Seminar / Presentation on Internship (After 8 weeks from the date of commencement of the semester). | - | - | - | 25 | - | 25 | |
| | **Project Phase: I** – Problem formulation and submission of synopsis within 8 weeks from the commencement of 3rd semester. | - | - | - | - | - | - | |
| 14SCS32 | **Evaluation of Internship** - To be carried out by the Internal Guide of the college and the respective Head of the Department. | - | - | - | 50 | | 50 | |
| 14SCS33 | **Viva-Voce on Internship Report** - To be conducted *internally* by the Internship Guide (from the college) and the External Guide under whose supervision the student has carried out the internship. | - | - | - | - | 75 | 75 | |
| | **Project Phase: II** – Preliminary work on Project Implementation. | - | - | - | - | - | - | |
| | **Total** | - | - | - | **75** | **75** | **150** | **20** |



## VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI
## SCHEME OF TEACHING AND EXAMINATION FOR
## M.Tech. in Computer Science and Engineering

**IV Semester**

**CREDIT BASED**

| Subject Code | Subject | No. of Hrs./Week | | Duration of Exam in Hours | Marks for | | Total Marks | CREDITS |
|---|---|---|---|---|---|---|---|---|
| | | Lecture | Field Work / Assignment / Tutorials | | I.A. | Exam | | |
| 14SCS41 | Machine Learning Techniques | 4 | 2 | 3 | 50 | 100 | 150 | 4 |
| 14SCS42x | Elective-III | 4 | 2 | 3 | 50 | 100 | 150 | 4 |
| 14SCS43 | Interim Evaluation of Project work (after 10 weeks from the commencement of 4th Semester). | - | - | - | 50 | - | 50 | 2 |
| 14SCS44 | Final Evaluation of Project Work and Viva-voce. | - | - | 3 | - | 100+100 | 200 | 18 |
| | **Total** | **8** | **04** | **09** | **150** | **400** | **550** | **28** |
| | | | | | | **Grand Total (I to IV Sem.) : 2400 Marks; 94 Credits** | | |

| Elective-III | |
|---|---|
| 14SCS421 | Computer Vision |
| 14SCS422 | Business Intelligence and its Applications |
| 14SCS423 | Agile Technologies |
| 14SCS424 | Wireless Network and Mobile Computing |

## SEMESTER : IV
## MACHINE LEARNING TECHNIQUES

**Course Code : 14SCS41 Credits(L:T:P):3:0:1**
**Core/Elective : Core Type of Course: Lecture & Practical**
**Total Contact Hours : 50 Hrs**

**COURSE OBJECTIVES:**

- To understand the basic concepts of learning and decision trees.
- To understand the neural networks and genetic algorithms
- To understand the Bayesian techniques
- To understand the instant based learning
- To understand the analytical learning and reinforced learning

**TOPICS:**

### Module I

**INTRODUCTION, CONCEPT LEARNING AND DECISION TREES**

Learning Problems – Designing Learning systems, Perspectives and Issues – Concept Learning – Version Spaces and Candidate Elimination Algorithm – Inductive bias – Decision Tree learning – Representation – Algorithm – Heuristic Space Search.

**10 Hrs**

### Module II

**NEURAL NETWORKS AND GENETIC ALGORITHMS**

Neural Network Representation – Problems – Perceptrons – Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms – Hypothesis Space Search – Genetic Programming – Models of Evolution and Learning.

**10 Hrs**

### Module III

**BAYESIAN AND COMPUTATIONAL LEARNING**

Bayes Theorem – Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes Optimal Classifier – Gibbs Algorithm – Naïve Bayes Classifier – Bayesian Belief Network – EM Algorithm – Probably Learning – Sample Complexity for Finite and Infinite Hypothesis Spaces – Mistake Bound Model.

**10 Hrs**



### Module IV

**INSTANT BASED LEARNING AND LEARNING SET OF RULES**

K- Nearest Neighbor Learning – Locally Weighted Regression – Radial Basis Functions – Case-Based Reasoning – Sequential Covering Algorithms – Learning Rule Sets – Learning First Order Rules – Learning Sets of First Order Rules – Induction as Inverted Deduction – Inverting Resolution

**10 Hrs**

### Module V

**ANALYTICAL LEARNING AND REINFORCED LEARNING**

Perfect Domain Theories – Explanation Based Learning – Inductive-Analytical Approaches - FOCL Algorithm – Reinforcement Learning – Task – Q-Learning – Temporal Difference Learning

**10 Hrs**

**LABORATORY WORK :**

(The following tasks can be implemented in a language of your choice or any tools available)

1) Implement the CANDIDATE – ELIMINATION algorithm. Show how it is used to learn from training examples and hypothesize new instances in Version Space.
2) Implement the FIND–S algorithm. Show how it can be used to classify new instances of target concepts. Run the experiments to deduce instances and hypothesis consistently.
3) Implement the ID3 algorithm for learning Boolean–valued functions for classifying the training examples by searching through the space of a Decision Tree.
4) Design and implement the Back-propagation algorithm by applying it to a learning task involving an application like FACE RECOGNITION.
5) Design and implement Naïve Bayes Algorithm for learning and classifying TEXT DOCUMENTS.

**COURSE OUTCOMES:**

On Completion of the course, the students will be able to

- Choose the learning techniques with this basic knowledge.
- Apply effectively neural networks and genetic algorithms for appropriate applications.
- Apply bayesian techniques and derive effectively learning rules.
- Choose and differentiate reinforcement and analytical learning techniques

**TEXT BOOK:**

1. Tom M. Mitchell, "Machine Learning", McGraw-Hill Education (INDIAN EDITION), 2013.

**REFERENCES:**

2. Ethem Alpaydin, "Introduction to Machine Learning", 2nd Ed., PHI Learning Pvt. Ltd., 2013.
3. T. Hastie, R. Tibshirani, J. H. Friedman, "The Elements of Statistical Learning", Springer; 1st edition, 2001.



**SEMESTER : IV**

## COMPUTER VISION

| | | |
|---|---|---|
| **Course Code** | **: 14SCS421** | **Credits(L:T:P):4:0:0** |
| **Core/Elective** | **: Elective** | **Type of Course: Lecture** |
| **Total Contact Hours : 50 Hrs** | | |

**Course Objectives:**

- To review image processing techniques for computer vision
- To understand shape and region analysis
- To understand Hough Transform and its applications to detect lines, circles, ellipses
- To understand three-dimensional image analysis techniques
- To understand motion analysis
- To study some applications of computer vision algorithms

**TOPICS:**

**Module I**

**CAMERAS:** Pinhole Cameras, Radiometry – Measuring Light: Light in Space, Light Surfaces, Important Special Cases, Sources, Shadows, And Shading: Qualitative Radiometry, Sources and Their Effects, Local Shading Models, Application: Photometric Stereo, Interreflections: Global Shading Models, Color: The Physics of Color, Human Color Perception, Representing Color, A Model for Image Color, Surface Color from Image Color.

**10 Hours**

**Module II**

**Linear Filters:** Linear Filters and Convolution, Shift Invariant Linear Systems, Spatial Frequency and Fourier Transforms, Sampling and Aliasing, Filters as Templates, Edge Detection: Noise, Estimating Derivatives, Detecting Edges, Texture: Representing Texture, Analysis (and Synthesis) Using Oriented Pyramids, Application: Synthesis by Sampling Local Models, Shape from Texture.

**10 Hours**

**Module III**

**The Geometry of Multiple Views:** Two Views, Stereopsis: Reconstruction, Human Stereposis, Binocular Fusion, Using More Cameras, Segmentation by Clustering: What Is Segmentation?, Human Vision: Grouping and Getstalt, Applications: Shot Boundary Detection and Background Subtraction, Image

Segmentation by Clustering Pixels, Segmentation by Graph-Theoretic Clustering,

**10 Hours**

**Module IV**

**Segmentation by Fitting a Model:** The Hough Transform, Fitting Lines, Fitting Curves, Fitting as a Probabilistic Inference Problem, Robustness, Segmentation and Fitting Using Probabilistic Methods: Missing Data Problems, Fitting, and Segmentation, The EM Algorithm in Practice, Tracking With Linear Dynamic Models: Tracking as an Abstract Inference Problem, Linear Dynamic Models, Kalman Filtering, Data Association, Applications and Examples.

**10 Hours**

**Module V**

**Geometric Camera Models:** Elements of Analytical Euclidean Geometry, Camera Parameters and the Perspective Projection, Affine Cameras and Affine Projection Equations, Geometric Camera Calibration: Least-Squares Parameter Estimation, A Linear Approach to Camera Calibration, Taking Radial Distortion into Account, Analytical Photogrammetry, An Application: Mobile Robot Localization, Model- Based Vision: Initial Assumptions, Obtaining Hypotheses by Pose Consistency, Obtaining Hypotheses by pose Clustering, Obtaining Hypotheses Using Invariants, Verification, Application: Registration In Medical Imaging Systems, Curved Surfaces and Alignment.

**10 Hours**

**Course Outcomes:**

Upon completion of the course, the students will be able to

- Implement fundamental image processing techniques required for computer vision
- Perform shape analysis
- Implement boundary tracking techniques
- Apply chain codes and other region descriptors
- Apply Hough Transform for line, circle, and ellipse detections.
- Apply 3D vision techniques.
- Implement motion related techniques.
- Develop applications using computer vision techniques.



**TEXT BOOKS :**

1. David A. Forsyth and Jean Ponce: Computer Vision – A Modern Approach, PHI Learning (Indian Edition), 2009.

**REFERENCES:**

1. E. R. Davies: Computer and Machine Vision – Theory, Algorithms and Practicalities, Elsevier (Academic Press), 4th edition, 2013.

SEMESTER : IV

## BUSINESS INTELLIGENCE AND ITS APPLICATIONS

| | | |
|---|---|---|
| **Course Code** | **: 14SCS422** | **Credits(L:T:P):4:0:0** |
| **Core/Elective** | **: Elective** | **Type of Course: Lecture** |
| **Total Contact Hours : 50 Hrs** | | |

**Course Objectives:**

- To Implement the key elements of a successful business intelligence (BI) program
- To Apply a BI meta model that turns outcomes into actions
- To Extract and transform data from an operational data to a data business data
- To Exploit business analytics and performance measurement tools

**TOPICS:**

**Module I**

**Development Steps**, BI Definitions, BI Decision Support Initiatives, Development Approaches, Parallel Development Tracks, BI Project Team Structure, Business Justification, Business Divers, Business Analysis Issues, Cost – Benefit Analysis, Risk Assessment, Business Case Assessment Activities, Roles Involved In These Activities, Risks Of Not Performing Step, Hardware, Middleware, DBMS Platform, Non Technical Infrastructure Evaluation

**10 Hours**

**Module II**

**Managing The BI Project,** Defining And Planning The BI Project, Project Planning Activities, Roles And Risks Involved In These Activities, General Business Requirement, Project Specific Requirements, Interviewing Process

**10 Hours**

**Module III**

**Differences in Database Design Philosophies,** Logical Database Design, Physical Database Design, Activities, Roles And Risks Involved In These Activities, Incremental Rollout, Security Management, Database Backup And Recovery

**10 Hours**



**Module IV**

**Growth Management,** Application Release Concept, Post Implementation Reviews, Release Evaluation Activities, The Information Asset and Data Valuation, Actionable Knowledge – ROI, BI Applications, The Intelligence Dashboard

**10 Hours**

**Module V**

**Business View of Information technology Applications:** Business Enterprise excellence, Key purpose of using IT, Type of digital data, basics f enterprise reporting, BI road ahead.

**10 Hours**

**Course Outcomes:**

Upon completion of the course, the students will be able to

- know the complete life cycle of BI/Analytical development
- Understand the technology and processes associated with Business Intelligence framework
- Given a business scenario, identify the metrics, indicators and make recommendations to achieve the business goal.

**TEXT BOOKS:**


1. Larissa T Moss and ShakuAtre – Business Intelligence Roadmap : The Complete Project Lifecycle for Decision Support Applications, Addison Wesley Information Technology Series, 2003.
2. R N Prasad, SeemaAcharya – Fundamentals of Business Analytics , Wiley India, 2011.


**REFERENCE BOOKS:**


1. David Loshin - Business Intelligence: The Savvy Manager's Guide, Publisher: Morgan Kaufmann, ISBN 1-55860-196-4.
2. Brian Larson - Delivering Business Intelligence with Microsoft SQL Server 2005, McGraw Hill, 2006.
3. Lynn Langit - Foundations of SQL Server 2008 Business Intelligence – Apress, ISBN13: 978-1-4302-3324-4, 2011

## SEMESTER : IV
## AGILE TECHNOLOGIES

| | | |
|---|---|---|
| **Course Code** | **: 14SCS423** | **Credits(L:T:P):4:0:0** |
| **Core/Elective** | **: Elective** | **Type of Course: Lecture** |
| **Total Contact Hours : 50 Hrs** | | |

**COURSE OBJECTIVES :**

- To understand how an iterative, incremental development process leads to faster delivery of more useful software
- To understand the essence of agile development methods
- To understand the principles and practices of extreme programming
- To understand the roles of prototyping in the software process
- To understand the concept of Mastering Agility

**TOPICS:**

### Module I

**Why Agile?:** Understanding Success, Beyond Deadlines, The Importance of Organizational Success, Enter Agility, How to Be Agile?: Agile Methods, Don't Make Your Own Method, The Road to Mastery, Find a Mentor

**10 Hours**

### Module II

**Understanding XP:** The XP Lifecycle, The XP Team, XP Concepts, Adopting XP: Is XP Right for Us?, Go!, Assess Your Agility

**10 Hours**

### Module III

**Practicing XP:** Thinking: Pair Programming, Energized Work, Informative Workspace, Root-Cause Analysis, Retrospectives, Collaborating: Trust, Sit Together, Real Customer Involvement, Ubiquitous Language, Stand-Up Meetings, Coding Standards, Iteration Demo, Reporting, Releasing:"Done Done", No Bugs, Version Control, Ten-Minute Build, Continuous Integration, Collective Code Ownership, Documentation. Planning: Vision, Release Planning, The Planning Game, Risk Management, Iteration Planning, Slack, Stories, Estimating. Developing: Incremental requirements, Customer Tests, Test-Driven Development, Refactoring, Simple Design ,Incremental Design and Architecture, Spike Solutions, Performance Optimization, Exploratory Testing

**10 Hours**



### Module IV

**Mastering Agility Values and Principles:** Commonalities, About Values, Principles, and Practices, Further Reading, Improve the Process: Understand Your Project, Tune and Adapt, Break the Rules, Rely on People :Build Effective Relationships, Let the Right People Do the Right Things, Build the Process for the People, Eliminate Waste :Work in Small, Reversible Steps, Fail Fast, Maximize Work Not Done, Pursue Throughput

**10 Hours**

### Module V

**Deliver Value:** Exploit Your Agility, Only Releasable Code Has Value, Deliver Business Results, Deliver Frequently, Seek Technical Excellence :Software Doesn't Exist, Design Is for Understanding, Design Trade-offs, Quality with a Name, Great Design, Universal Design Principles, Principles in Practice, Pursue Mastery

**10 Hours**

**COURSE OUTCOMES :**

Students should be able to

- Understand The XP Lifecycle, XP Concepts, Adopting XP
- Work on Pair Programming, Root-Cause Analysis, Retrospectives, Planning, Incremental Requirements, Customer Tests
- Implement Concepts to Eliminate Waste

**TEXT BOOKS:**

1. The Art of Agile Development (Pragmatic guide to agile software development), James shore, Chromatic, O'Reilly Media, Shroff Publishers & Distributors, 2007

**REFERENCE BOOKS:**

1. Agile Software Development, Principles, Patterns, and Practices, Robert C. Martin, Prentice Hall; 1st edition, 2002
2. "Agile and Iterative Development A Manger's Guide", Craig Larman Pearson Education, First Edition, India, 2004.

## SEMESTER : IV
## WIRELESS NETWORKS AND MOBILE COMPUTING

| | | |
|---|---|---|
| **Course Code** | **: 14SCS424** | **Credits(L:T:P):4:0:0** |
| **Core/Elective** | **: Elective** | **Type of Course: Lecture** |
| **Total Contact Hours : 50 Hrs** | | |

**COURSE OBJECTIVES :**

- To introduce the concepts of wireless communication.
- To understand various propagation methods, Channel models, capacity calculations multiple antennas and multiple user techniques used in the mobile communication.
- To understand CDMA, GSM, Mobile IP, WImax
- To understand Different Mobile OS
- To learn various Markup Languages
- CDC, CLDC, MIDP; Programming for CLDC, MIDlet model and security concerns

**TOPICS:**

### Module I

**Mobile Computing Architecture:** Architecture for Mobile Computing, 3-tier Architecture, Design Considerations for Mobile Computing. Wireless Networks : Global Systems for Mobile Communication ( GSM and Short Service Messages (SMS): GSM Architecture, Entities, Call routing in GSM, PLMN Interface, GSM Addresses and Identities, Network Aspects in GSM, Mobility Management, GSM Frequency allocation. Introduction to SMS, SMS Architecture, SM MT, SM MO, SMS as Information bearer, applications, GPRS and Packet Data Network, GPRS Network Architecture, GPRS Network Operations, Data Services in GPRS, Applications for GPRS, Billing and Charging in GPRS, Spread Spectrum technology, IS-95, CDMA versus GSM, Wireless Data, Third Generation Networks, Applications on 3G, Introduction to WiMAX.

**10 Hours**

### Module II

**Mobile Client:** Moving beyond desktop, Mobile handset overview, Mobile phones and their features, PDA, Design Constraints in applications for handheld devices. Mobile IP: Introduction, discovery, Registration, Tunneling, Cellular IP, Mobile IP with IPv6.

**10 Hours**



### Module III

**Mobile OS and Computing Environment:** Smart Client Architecture, The Client: User Interface, Data Storage, Performance, Data Synchronization, Messaging. The Server: Data Synchronization, Enterprise Data Source, Messaging. Mobile Operating Systems: WinCE, Palm OS, Symbian OS, Linux and Proprietary OS Client Development: The development process, Need analysis phase, Design phase, Implementation and Testing phase, Deployment phase, Development Tools, Device Emulators.

**10 Hours**

### Module IV

**Building, Mobile Internet Applications:** Thin client: Architecture, the client, Middleware, messaging Servers, Processing a Wireless request, Wireless Applications Protocol (WAP) Overview, Wireless Languages: Markup Languages, HDML, WML, HTML, cHTML, XHTML, VoiceXML.

**10 Hours**

### Module V

**J2ME:** Introduction, CDC, CLDC, MIDP; Programming for CLDC, MIDlet model, Provisioning, MIDlet life-cycle, Creating new application, MIDlet event handling, GUI in MIDP, Low level GUI Components, Multimedia APIs; Communication in MIDP, Security Considerations in MIDP.

**10 Hours**

**COURSE OUTCOMES:**

The student should be able to:

- Work on state of art techniques in wireless communication.
- Explore CDMA, GSM, Mobile IP, WiMax
- Work on Different Mobile OS
- Develop program for CLDC, MIDP let model and security concerns

**TEXT BOOKS:**

1. Ashok Talukder, Roopa Yavagal, Hasan Ahmed: Mobile Computing, Technology, Applications and Service Creation, 2nd Edition, Tata McGraw Hill, 2010.
2. Martyn Mallik: Mobile and Wireless Design Essentials, Wiley India, 2003

**REFERENCE BOOKS:**

1. Raj kamal: Mobile Computing, Oxford University Press, 2007.
2. Iti Saha Misra: Wireless Communications and Networks, 3G and Beyond, Tata McGraw Hill, 2009.