**PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY SOLAPUR**

# FACULTY OF ENGINEERING & TECHNOLOGY

# INFORMATION TECHNOLOGY

## Syllabus Structure for

### F.E. (All Branches) w.e.f. Academic Year 2016-17

### S.E. (Information Technology) w.e.f. Academic Year 2017-18

### T.E. (Information Technology) w.e.f. Academic Year 2018-19

### B.E. (Information Technology) w.e.f. Academic Year 2019-20

## Choice Based Credit System

**Punyashlok Ahilyadevi Holkar Solapur University Solapur**

**FACULTY OF ENGINEERING & TECHNOLOGY**

**Information Technology**

**Program Educational Objectives and Outcomes**

## A. Program Educational Objectives

1. Graduates will exhibit strong fundamental knowledge and skills in the field of Information Technology to pursue successful professional careers and higher studies and research.
2. Graduates will exhibit capabilities to understand and resolve the various societal issues through their problem solving skills.
3. Graduates will be sensitive to ethical, societal and environmental issues while serving at their professional work and society.

## B. Program Outcomes

Engineering Graduate will be able to –

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **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.
3. **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.
4. **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.
5. **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.

6. **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.
7. **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.
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **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.
11. **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.
12. **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.

## Program Specific Outcomes (PSOs)

**PSO1.** Student will be able to apply fundamentals of mathematics, algorithms and computational systems to Information Technology.

**PSO2**. Student will be able to provide a solution to the problem in the areas of Networking, Database management, System Software, Web Technology, Information Security and Thrust areas..

**PSO3.** Student will be able to design and develop IT solution for societal problem/s, while encouraging usage of Free Open Source Software (FOSS).

# Punyashlok Ahilyadevi Holkar Solapur University, Solapur

## FACULTY OF ENGINEERING & TECHNOLOGY

## CBCS Curriculum for First Year (All Branches)

### WEF 2016-17

- Semester I : Theory Courses

| Course Code | Name of the Course | Engagement Hours | | | Credits | FA | SA | | Total |
|---|---|---|---|---|---|---|---|---|---|
| | | L | T | P | | ESE | ISE | ICA | |
| C011/ C012 | Engineering Physics / Engineering Chemistry$ | 4 | | | 4 | 70 | 30 | | 100 |
| C112 | Engineering Mathematics I | 3 | | | 3 | 70 | 30 | | 100 |
| C113 | Applied Mechanics | 4 | | | 4 | 70 | 30 | | 100 |
| C114 | Basic Electrical Engineering | 3 | | | 3 | 70 | 30 | | 100 |
| C115 | Basic Mechanical Engineering | 3 | | | 3 | 70 | 30 | | 100 |
| C116 | Communication Skills | 1 | | | 1 | | 25 | | 25 |
| | **Total** | **18** | | | **18** | **350** | **175** | | **525** |

☐ Semester I : Laboratory / Tutorial Courses

| Course Code | Name of the Course | Engagement Hours | | | Credits | FA | SA | | Total |
|---|---|---|---|---|---|---|---|---|---|
| | | L | T | P | | ESE | ISE | ICA | |
| C011/ C012 | Engineering Physics / Engineering Chemistry$ | | | 2 | 1 | | | 25 | 25 |
| C112 | Engineering Mathematics I | | 1 | | 1 | | | 25 | 25 |
| C113 | Applied Mechanics | | | 2 | 1 | | | 25 | 25 |
| C114 | Basic Electrical Engineering | | | 2 | 1 | | | 25 | 25 |
| C115 | Basic Mechanical Engineering | | | 2 | 1 | | | 25 | 25 |
| C116 | Communication Skills | | | 2 | 1 | | | 25 | 25 |
| C117 | Workshop Practice | | | 2 | 1 | | | 25 | 25 |
| | **Total** | | **1** | **12** | **7** | | | **175** | **175** |
| | **Grand Total** | **18** | **1** | **12** | **25** | **350** | **175** | **175** | **700** |

Semester II : Theory Courses

| Course Code | Name of the Course | Engagement Hours | | | Credits | FA | SA | | Total |
|---|---|---|---|---|---|---|---|---|---|
| | | L | T | P | | ESE | ISE | ICA | |
| C011/ C012 | Engineering Physics / Engineering Chemistry$ | 4 | | | 4 | 70 | 30 | | 100 |
| C122 | Engineering Mathematics II | 3 | | | 3 | 70 | 30 | | 100 |
| C123 | Engineering Graphics | 3 | | | 3 | 70 | 30 | | 100 |
| C124 | Basic Civil Engineering | 3 | | | 3 | 70 | 30 | | 100 |
| C125 | Computer Programming | 2 | | | 2 | | 25 | | 25 |
| C126 | Basic Electronics | 2 | | | 2 | 35 | 15 | | 50 |
| C127 | Professional Communication | 1 | | | 1 | | 25 | | 25 |
| | **Total** | **18** | | | **18** | **315** | **185** | | **500** |

 Semester II : Laboratory / Tutorial  Courses

| Course Code | Name of the Course | Engagement Hours | | | Credits | FA | SA | | Total |
|---|---|---|---|---|---|---|---|---|---|
| | | L | T | P | | ESE | ISE | ICA | |
| C011/ C012 | Engineering Physics / Engineering Chemistry$ | | | 2 | 1 | | | 25 | 25 |
| C122 | Engineering Mathematics II | | 1 | | 1 | | | 25 | 25 |
| C123 | Engineering Graphics | | | 4 | 2 | | | 25 | 25 |
| C124 | Basic Civil Engineering | | | 2 | 1 | | | 25 | 25 |
| C125 | Computer Programming | | | 2 | 1 | 25# | | 25 | 50 |
| C126 | Basic Electronics | | | 2* | 1 | | | 25 | 25 |
| C127 | Professional Communication | | | 2 | 1 | | | 25 | 25 |
| C128 | Audit Course- Workshop for Skill Development | | | @ | AU | Audit Course | | | |
| | **Total** | | **1** | **13** | **8** | **25** | | **175** | **200** |
| | **Grand Total** | **18** | **1** | **13** | **26** | **340** | **185** | **175** | **700** |

 Legends used –

L   Lecture             FA      Formative Assessment
T   Tutorial            SA      Summative Assessment
P   Lab Session      ESE    End Semester Examination
                          ISE     In Semester Evaluation
                          ICA     Internal Continuous Assessment

□ **Notes-**

1. $ - Indicates approximately half of the total students at FE will enroll under Group A and remaining will enroll under Group B.

   Group A will take up course of Engineering Physics (theory & laboratory) in Semester I and will take up course of Engineering Chemistry (theory & laboratory) in semester II.

   Group B will take up course of Engineering Chemistry (theory & laboratory) in Semester I and will take up course of Engineering Physics (theory & laboratory) in semester II

2. * - Indicates the subject 'Basic Electronics' shall have lab session every alternate week

3. # - Indicates the subject 'Computer Programming' shall have a University 'Practical and Oral Examination' at the end of the semester assessing student's programming skills.

4. In Semester Evaluation (ISE) marks shall be based upon student's performance in minimum two tests & mid-term written test conducted & evaluated at institute level

   Internal Continuous Assessment Marks (ICA) are calculated based upon student's performance during laboratory sessions / tutorial sessions

5. Audit Course 'Workshop for Skill Development' intends to develop few basic skills amongst student related to any one engineering discipline of student's choice (irrespective of his discipline of admission). There is no separate laboratory hours specified for this course. Student can use some of the respective laboratory sessions in the semester for this course as indicated below. If required, student can work beyond regular engagement hours under supervision of the concerned teacher to complete this course.

| Sr. | Skill Development in | Course of which some laboratory hours can be used |
|---|---|---|
| 1 | Electronics, Electronics & Telecommunication, Electrical, Electrical & Electronics, Biomedical Engineering | Basic Electronics |
| 2 | Computer Science & Engineering, Information Technology | Computer Programming |
| 3 | Mechanical Engineering, Biomedical Engineering | Engineering Graphics |
| 4 | Civil Engineering | Basic Civil Engineering |

Each institute is at liberty to decide content to be delivered under this course by an apt teacher. However it is desirable that this course shall nurture individual and team working skills of the student. Some of the exemplary skills (but not limited to) are listed in curriculum of this course.

The summative assessment of this course shall be carried out at institute level and the institute shall certify successful completion of this audit course by student.

6. @- indicates there is no separate laboratory hours for Audit Course- Workshop for Skill Development
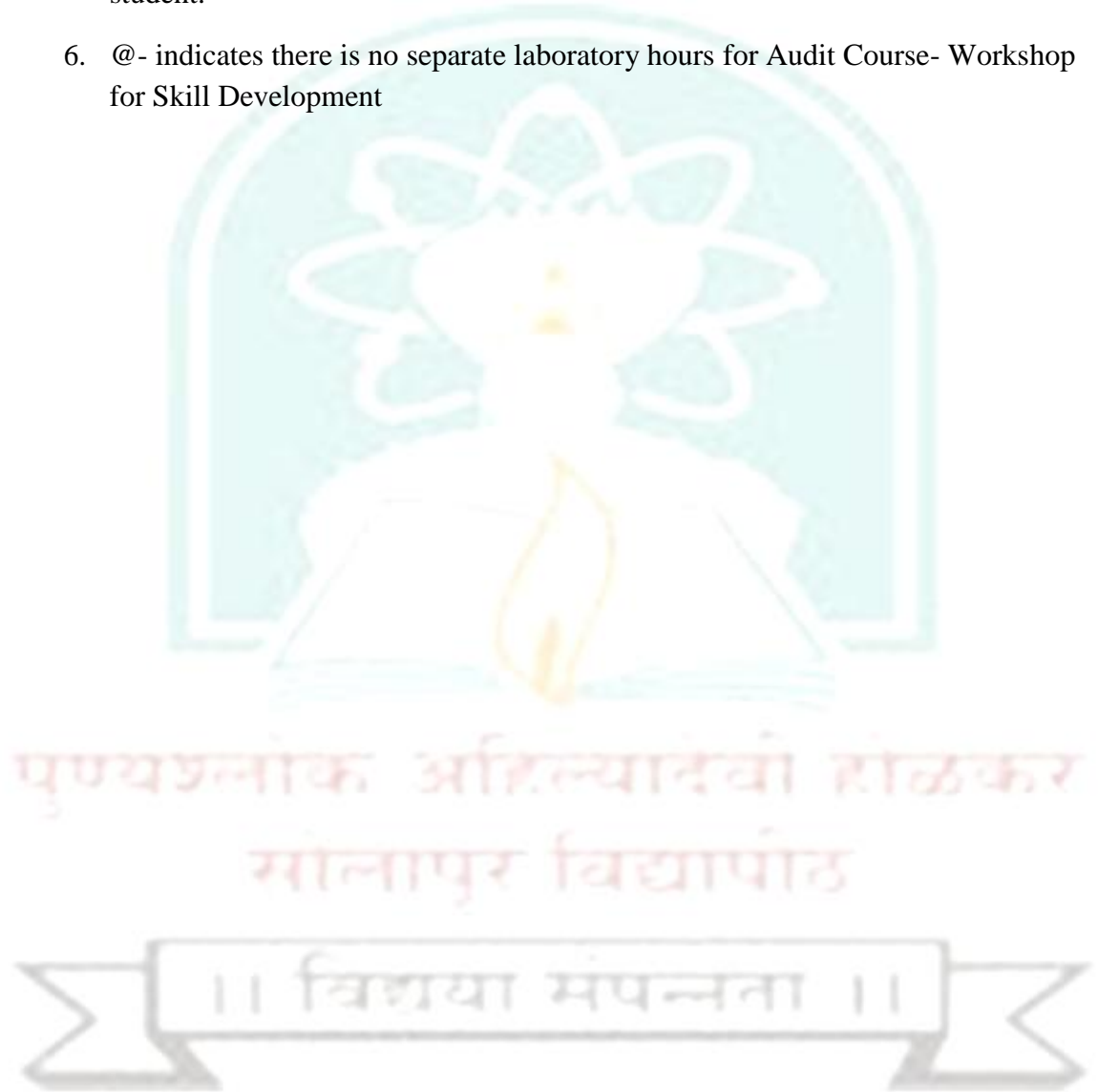
# Punyashlok Ahilyadevi Holkar Solapur University, Solapur

## Faculty of Engineering & Technology
## Second Year Information Technology

*Choice Based Credit System Syllabus Structure of S.E. Information Technology W.E.F. 2017-2018*

*Semester I*

| Course Code | Theory Course Name | Hrs./week | | | Credits | Examination Scheme | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | L | T | P | | ISE | ESE | ICA | Total |
| IT211 | Applied Mathematics - I | 3 | 1 | -- | 4 | 30 | 70 | 25 | 125 |
| IT212 | Discrete Mathematical Structure | 3 | 1 | -- | 4 | 30 | 70 | 25 | 125 |
| IT213 | Data Communication | 3 | -- | -- | 3 | 30 | 70 | -- | 100 |
| IT214 | Digital Logic Design | 3 | -- | -- | 3 | 30 | 70 | -- | 100 |
| IT215 | Computer Graphics | 3 | -- | -- | 3 | 30 | 70 | -- | 100 |
| IT216 | Programming in C | 3 | -- | -- | 3 | -- | -- | -- | -- |
| | **Sub Total** | 18 | 2 | -- | 20 | 150 | 350 | 50 | 550 |
| ENV21 | Environmental Science | 1 | - | - | - | - | - | - | 1 |

| Course Code | Laboratory Course Name | | | | | | ESE | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | POE | OE | | |
| IT213 | Data Communication | -- | -- | 2 | 1 | -- | 50 | -- | 25 | 75 |
| IT214 | Digital Logic Design | -- | -- | 2 | 1 | -- | 50 | -- | 25 | 75 |
| IT215 | Computer Graphics | -- | -- | 2 | 1 | -- | | -- | 25 | 25 |
| IT216 | Programming in C | -- | -- | 4 | 2 | -- | 50 | -- | 25 | 75 |
| | **Sub Total** | -- | -- | 10 | 5 | -- | 150 | | 100 | 250 |
| | **Grand Total** | 18 | 2 | 10 | 25 | 150 | 500 | | 150 | 800 |

- *Abbreviations: L- Lectures, P –Practical, T- Tutorial, ISE- In Semester Exam, ESE - End Semester Exam,ICA- Internal Continuous Assessment, ESE - University Examination (Theory &/ POE &/Oral examination)*

## Note

1. Student is required to study and pass Environmental Science subject in Second Year of Engineering to become eligible for award of degree.

2. Batch size for the practical /tutorial shall be of 20 students. On forming the batches, if the strength of remaining students exceeds 9, then a new batch shall be formed.

3. Vocational Training (evaluated at B.E. Part-I) of minimum 15 days shall be completed in any vacation after S.E. Part-II but before B.E. Part-I & the report shall be submitted and evaluated in B.E. Part-I

4. Student shall select one Self Learning Module at T.E. Part I and T.E. Part II each from Technical and Humanities and Social Sciences Group with at least one Self Learning Module from the Humanities and Social Sciences Group

5. Curriculum for Humanities and Social Sciences Self Learning Modules is common for all under graduate programmes of faculty of Engineering and Technology

6. ICA assessment shall be a continuous process based on student's performance in – class tests, assignments, homework, subject seminars, quizzes, laboratory books and their interaction and attendance for theory and lab sessions as applicable

*Choice Based Credit System Structure of S.E. Information Technology W.E.F. 2017-2018*

*Semester II*

| Course Code | Theory Course Name | Hrs./week | | | Credits | Examination Scheme | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | L | T | P | | ISE | ESE | ICA | Total |
| IT221 | Applied Mathematics – II | 3 | 1 | -- | 4 | 30 | 70 | 25 | 125 |
| IT222 | Theory of Computation | 3 | 1 | -- | 4 | 30 | 70 | 25 | 125 |
| IT223 | Microprocessor | 3 | -- | -- | 3 | 30 | 70 | -- | 100 |
| IT224 | Data Structures | 3 | -- | -- | 3 | 30 | 70 | -- | 100 |
| IT225 | Computer Networks | 3 | -- | -- | 3 | 30 | 70 | -- | 100 |
| IT226 | Object Oriented Programming through C++ | 3 | -- | -- | 3 | -- | -- | -- | -- |
| ENV22 | Environmental Science | 1 | - | - | - | - | - | - | 1 |
| | **Sub Total** | **18** | **2** | **--** | **20** | **150** | **350** | **50** | **550** |

| Course Code | Laboratory Course Name | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | ESE | | |
| | | | | | | | POE | OE | |
| IT223 | Microprocessor | -- | -- | 2 | 1 | -- | 50 | -- | 25 | 75 |
| IT224 | Data Structures | -- | -- | 4 | 2 | -- | 50 | -- | 25 | 75 |
| IT225 | Computer Networks | -- | -- | 2 | 1 | -- | - | -- | 25 | 25 |
| IT226 | Object Oriented Programming through C++ | -- | -- | 2 | 1 | -- | 50 | -- | 25 | 75 |
| | **Sub Total** | | _ | **10** | **5** | | **150** | | **--** | **250** |
| | **Grand Total** | **18** | **2** | **10** | **25** | **150** | **500** | | **--** | **800** |

- *Abbreviations: L- Lectures, P –Practical, T- Tutorial, ISE- In Semester Exam, ESE - End Semester Exam, ICA- Internal Continuous Assessment, ESE - University Examination (Theory &/ POE &/Oral examination)*

## Note

1. Student is required to study and pass Environmental Science subject in Second Year of Engineering to become eligible for award of degree.

2. Batch size for the practical /tutorial shall be of 20 students. On forming the batches, if the strength of remaining students exceeds 9, then a new batch shall be formed.

3. Vocational Training (evaluated at B.E. Part-I) of minimum 15 days shall be completed in any vacation after S.E. Part-II but before B.E. Part-I & the report shall be submitted and evaluated in B.E. Part-I

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6. ICA assessment shall be a continuous process based on student's performance in – class tests, assignments, homework, subject seminars, quizzes, laboratory books and their interaction and attendance for theory and lab sessions as applicable

# Punyashlok Ahilyadevi Holkar Solapur University, Solapur

## Faculty of Engineering & Technology
## Third Year Information Technology

*Choice Based Credit System Syllabus Structure of T.E. Information Technology W.E.F. 2018-2019*

*Semester I*

| Course Code | Theory Course Name | L | T | P | Credits | ISE | ESE | ICA | Total |
|---|---|---|---|---|---|---|---|---|---|
| | | **Hrs./week** | | | | **Examination Scheme** | | | |
| IT311 | Principles of Operating System | 3 | -- | -- | 3 | 30 | 70 | -- | 100 |
| IT312 | System Software | 3 | -- | -- | 3 | 30 | 70 | -- | 100 |
| IT313 | Design and Analysis of Algorithms | 3 | 1 | -- | 4 | 30 | 70 | 25 | 125 |
| IT314 | Database Engineering | 4 | -- | -- | 4 | 30 | 70 | -- | 100 |
| IT315 | Computer Organization and Architecture | 3 | 1 | -- | 4 | 30 | 70 | 25 | 125 |
| IT316 | Java Programming | 2 | -- | -- | 2 | 25 | -- | -- | 25 |
| SLH31 | Self Learning Module-I | -- | -- | -- | 2 | -- | 50 | -- | 50 |
| | **Sub Total** | 18 | 2 | _ | 22 | 175 | 400 | 50 | 625 |

| Course Code | Laboratory Course Name | L | T | P | Credits | ISE | ESE POE | ESE OE | ICA | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| IT311 | Principles of Operating System | _ | _ | 2 | 1 | _ | 50 | -- | 25 | 75 |
| IT312 | System Software | _ | _ | 2 | 1 | _ | -- | _ | 25 | 25 |
| IT314 | Database Engineering | -- | -- | 2 | 1 | -- | 50 | -- | 25 | 75 |
| IT316 | Java Programming | _ | _ | 4 | 2 | _ | 50 | _ | 25 | 75 |
| | **Sub Total** | -- | -- | 10 | 5 | _ | 150 | | 100 | 250 |
| | **Grand Total** | 18 | 2 | 10 | 27 | 175 | 550 | | 150 | 875 |

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# Punyashlok Ahilyadevi Holkar Solapur University, Solapur

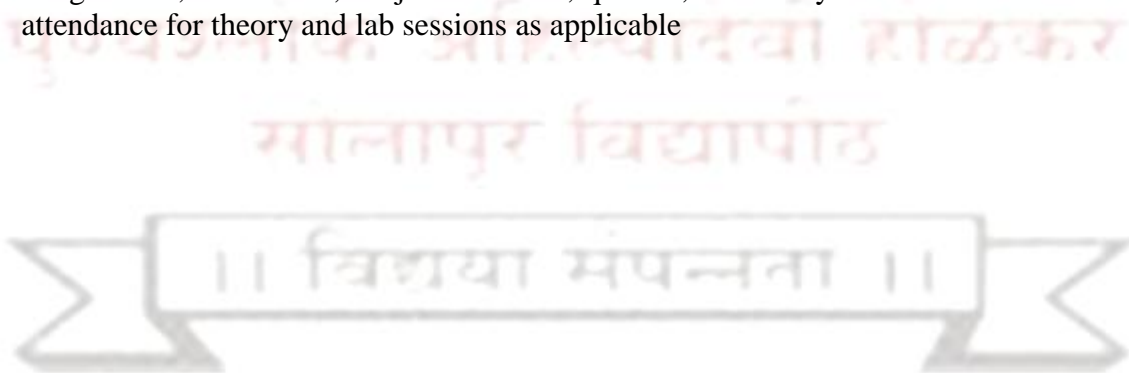## Faculty of Engineering & Technology
## Third Year Information Technology

*Choice Based Credit System Structure of T.E. Information Technology W.E.F. 2018-2019*

*Semester II*

| Course Code | Theory Course Name | L | T | P | Credits | ISE | ESE | ICA | Total |
|---|---|---|---|---|---|---|---|---|---|
| IT321 | Unix Operating System | 4 | -- | -- | 4 | 30 | 70 | -- | 100 |
| IT322 | Software Engineering | 3 | 1 | -- | 4 | 30 | 70 | 25 | 125 |
| IT323 | Object Oriented Modeling and Design | 3 | 1 | -- | 4 | 30 | 70 | 25 | 125 |
| IT324 | Artificial Intelligence | 3 | -- | -- | 3 | 30 | 70 | -- | 100 |
| IT325 | Mobile Application Development | 3 | -- | -- | 3 | 30 | 70 | -- | 100 |
| IT326 | Python Programming | 2 | -- | -- | 2 | 25 | -- | -- | 25 |
| IT327 | Self Learning Module-II | -- | -- | -- | 2 | -- | 50 | -- | 50 |
| | **Sub Total** | **18** | **2** | **--** | **22** | **175** | **400** | **50** | **625** |

| Course Code | Laboratory Course Name | L | T | P | Credits | ISE | ESE POE | ESE OE | ICA | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| IT321 | Unix Operating System | -- | -- | 2 | 1 | -- | -- | 25 | 25 | 50 |
| IT324 | Artificial Intelligence | -- | -- | 2 | 1 | -- | -- | -- | 25 | 25 |
| IT325 | Mobile Application Development | -- | -- | 2 | 1 | -- | 50 | _ | 25 | 75 |
| IT326 | Python Programming | -- | -- | 2 | 1 | -- | 50 | _ | 25 | 75 |
| IT328 | Seminar | -- | -- | 2 | 1 | | -- | -- | 25 | 25 |
| | **Sub Total** | | **--** | **10** | **5** | **--** | **125** | | **125** | **250** |
| | **Grand Total** | **18** | **2** | **10** | **27** | **175** | **525** | | **175** | **875** |
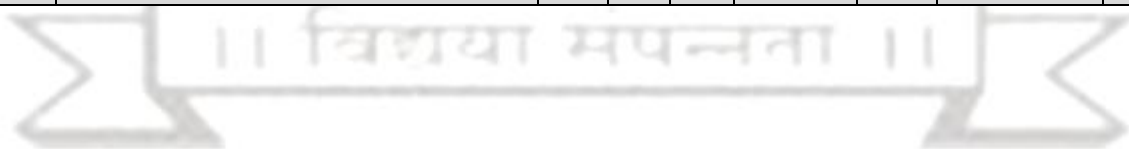
- *Abbreviations: L- Lectures, P –Practical, T- Tutorial, ISE- In Semester Exam, ESE - End Semester Exam,ICA- Internal Continuous Assessment, ESE - University Examination (Theory &/ POE &/Oral examination)*

1. Batch size for the practical /tutorial shall be of 15 students. On forming the batches, if the strength of remaining student exceeds 7, then a new batch shall be formed.

2. Vocational Training (evaluated at B.E. Part-I) of minimum 15 days shall be completed in any vacation after S.E. Part-II but before B.E. Part-I & the report shall be submitted and evaluated in B.E. Part-I

3. Student shall select one Self Learning Module at T.E. Part I and T.E. Part II each from Technical and Humanities and Social Sciences Group with at least one Self Learning Module from the Humanities and Social Sciences Group

4. Curriculum for Humanities and Social Sciences Self Learning Modules is common for all under graduate programmes of faculty of Engineering and Technology

5. Minimum four assignments for Self Learning Modules at T.E. Part I and T.E. Part II shall be submitted by the students which shall be evaluated by a Module Coordinator assigned by institute / department

6. Project groups for B.E. (I.T.) Part I and Part II formed at TE(IT) Part II for seminar shall not be of more than **five** students.

7. ICA assessment shall be a continuous process based on student's performance in – class tests, assignments, homework, subject seminars, quizzes, laboratory books and their interaction and attendance for theory and lab sessions as applicable

*Choice Based Credit System Syllabus Structure of B.E. Information Technology W.E.F. 2019-2020*

*Semester I*

| Course Code | Theory Course Name | L | T | P | Credits | ISE | ESE | ICA | Total |
|---|---|---|---|---|---|---|---|---|---|
| | | Hrs./week | | | | Examination Scheme | | | |
| IT411 | Management Information System | 3 | -- | _ | 3 | 30 | 70 | -- | 100 |
| IT412 | Advanced Database System | 4 | -- | _ | 4 | 30 | 70 | -- | 100 |
| IT413 | Software Testing and Quality Assurance | 3 | - | _ | 3 | 30 | 70 | 25 | 125 |
| IT414 | Mobile Computing | 3 | -- | _ | 3 | 30 | 70 | -- | 100 |
| IT415A to IT415D | Elective-I | 3 | -- | _ | 3 | 30 | 70 | 25 | 125 |
| IT416 | C# .Net | 2 | -- | -- | 2 | 25 | -- | -- | 25 |
| | **Sub Total** | **18** | **-** | **--** | **18** | **175** | **350** | **50** | **575** |

| Course Code | Laboratory Course Name | L | T | P | Credits | ESE POE | ESE OE | ICA | Total |
|---|---|---|---|---|---|---|---|---|---|
| IT411 | Management Information System | -- | -- | 2 | 1 | _ | -- | 25 | 25 |
| IT412 | Advanced Database System | -- | -- | 2 | 1 | 50 | -- | 25 | 75 |
| IT414 | Mobile Computing | -- | -- | 2 | 1 | _ | -- | 25 | 25 |
| IT416 | C# .Net | -- | -- | 2 | 1 | 50 | -- | 25 | 75 |
| IT417 | Project-I | -- | -- | 4 | 2 | -- | -- | 75 | 75 |
| IT418 | Vocational Training | -- | -- | -- | 1 | -- | -- | 25 | 25 |
| | **Sub Total** | **--** | **--** | **12** | **7** | **--** | **100** | **200** | **300** |
| | **Grand Total** | **18** | **--** | **12** | **25** | **175** | **450** | **250** | **875** |

- *Abbreviations: L- Lectures, P –Practical, T- Tutorial, ISE- In Semester Exam, ESE - End Semester Exam,ICA- Internal Continuous Assessment, ESE – University Examination (Theory &/ POE &/Oral examination)*

*Choice Based Credit System Structure of B.E. Information Technology W.E.F. 2019-2020*

*Semester II*

| Course Code | Theory Course Name | L | T | P | Credits | ISE | ESE | ICA | Total |
|---|---|---|---|---|---|---|---|---|---|
| | | **Hrs./week** | | | | **Examination Scheme** | | | |
| IT421 | Information Retrieval | 4 | -- | -- | 4 | 30 | 70 | -- | 100 |
| IT422 | Machine Learning | 3 | -- | -- | 3 | 30 | 70 | -- | 100 |
| IT423 | Information Assurance and Security | 4 | -- | -- | 4 | 30 | 70 | 25 | 125 |
| IT424A to IT424D | Elective –II | 3 | 2 | -- | 5 | 30 | 70 | 25 | 125 |
| IT425 | Web Technology | 2 | -- | -- | 2 | 50 | -- | -- | 50 |
| | **Sub Total** | **16** | **2** | **--** | **18** | **170** | **280** | **50** | **500** |

| Course Code | Laboratory Course Name | L | T | P | Credits | ESE POE | ESE OE | ICA | Total |
|---|---|---|---|---|---|---|---|---|---|
| IT421 | Information Retrieval | -- | -- | 2 | 1 | 50 | -- | 25 | 75 |
| IT422 | Machine Learning | -- | -- | 2 | 1 | -- | -- | 25 | 25 |
| IT425 | Web Technology | -- | -- | 2 | 1 | 50 | -- | 25 | 75 |
| IT426 | Project-II | -- | -- | 6 | 3 | -- | 100 | 100 | 200 |
| | **Sub Total** | **--** | **--** | **12** | **6** | **--** | **200** | **175** | **375** |
| | **Grand Total** | **16** | **2** | **12** | **24** | **170** | **480** | **225** | **875** |

- *Abbreviations: L- Lectures, P –Practical, T- Tutorial, ISE- In Semester Exam, ESE - End Semester Exam, ICA- Internal Continuous Assessment, ESE - University Examination (Theory &/ POE &/Oral examination)*

| Elective I | | Elective II | |
|---|---|---|---|
| Course Code | Course | Course Code | Course |
| IT415A | Data Mining | IT424A | Business Intelligence |
| IT415B | Image Processing | IT424B | Pattern Recognition |
| IT415C | Distributed Computing | IT424C | Cloud Computing |
| IT415D | Microcontroller and Embedded System | IT424D | Internet of Things |

**Note**

1. Batch size for the practical /tutorial shall be of 15 students. On forming the batches, if the strength of remaining students exceeds 7, then a new batch shall be formed.

2. Vocational Training (evaluated at B.E. Part-I) of minimum 15 days shall be completed in any vacation after S.E. Part-II but before B.E. Part-I & the report shall be submitted and evaluated in B.E. Part-I

3. Appropriate Elective I & II Subjects may be added when required.

4. Project group for B.E. (Information Technology) Part I and Part II shall not be of more than **five** students.

5. ICA assessment shall be a continuous process based on student's performance in – class tests, assignments, homework, subject seminars, quizzes, laboratory books and their interaction and attendance for theory and lab sessions as applicable

| **Teaching Scheme** | **Examination Scheme** |
|---|---|
| Lectures: 3 Hours/Week, 3 Credits | ESE- 70 Marks |
| Practical: 2 Hours/Week, 1 Credit | ISE - 30 Marks |
| | ICA - 25 Marks |

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## COURSE OBJECTIVES:

1. To study basics of infrastructure and strategies used in information systems.
2. To enable students to gather & analyze requirements and design information systems using principles of communication technologies for a given problem.
3. To introduce methods of implementing existing management information systems models for given domain.

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## COURSE OUTCOMES:

At the end of the course students will be able to
1. Describe basics of infrastructure and strategies used in information systems.
2. Gather & analyze requirements and design information systems using principles of communication technologies for a given problem.
3. Implement existing management information systems models for given domain.

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## SECTION-I

### Unit 1: Information Systems in Global Business Today                    ( 8 Hrs)

The Role of Information Systems in Business Today, How information systems are transforming business, What is new in information system Business Processes and Information systems, Systems for collaboration and social business, Tools and technologies for collaboration and social business.

### Unit 2: Information Systems, Organizations, and Strategy                    (6 Hrs)

Organizations and it's features, How Information Systems Impact on Organizations , Competitive strategies using information systems ,Challenges posed by strategic information systems.

### Unit 3: Ethical and Social Issues in Information Systems                    (6 Hrs)

Understanding Ethical, Social, political issues raised by information systems, principles for conduct in ethical decisions, Contemporary information systems technology, Challenges to the protection individual privacy and intellectual property.

## Unit 4: IT Infrastructure and Emerging Technologies (7 Hrs)

IT Infrastructure, Infrastructure Components, Contemporary Hardware, Platform Trends, Contemporary Software Platform Trends, Management Issues.

## Unit 5: Foundations of Business Intelligence: Databases and Information Management (8 Hrs)

Organizing Data in a Traditional File Environment, Major Capabilities of Database Management Systems, Using Databases to Improve Business Performance and Decision Making, Managing Data Resources, Telecommunications, the internet, and Wireless Technology: Principles Components of Telecommunications Network & Ket Networking Technologies, Different types of networks, principle technologies and standards for wireless networking, communication, internet access.

## Unit 6: Securing Information Systems (4 Hrs)

System Vulnerability and Abuse, Business Value of Security and Control, Organizational Framework for Security and Control, Technologies and Tools for safeguarding Information Resources.

## Unit 7: E-commerce: Digital Markets, Digital Goods (6 Hrs)

Features of e-commerce. Digital Markets, Digital Goods, principles ecommerce business and revenue models, e-commerce transformed marketing, e-commerce business to business transaction, Role of M-commerce in business & it's applications, issues related building e-commerce.

**Text Book:**
   1. Management Information Systems : Managing the Digital Firm, 15th Edition by Kenneth C.Laudon and Jane Laudon, Pearson Education.
   2. Management Information Systems: Sashikala Parimi, Kogent Learning Solutions Inc.

**Reference Books:**
   1. Information Technology for Management: Transforming Organizations in the Digital Economy,

   Efraim Turban,6th Edition, Wiley Edition.
   2. Management Information Systems: Shubhalakshmi Joshi, SmitaVaze, biztantra.

**Note:** Teacher can make a group of 4-5 students (or based on their project group) & assign Case Study given in the textbook (Sr.No.1) Evaluation will be done by teacher by considering different factors.
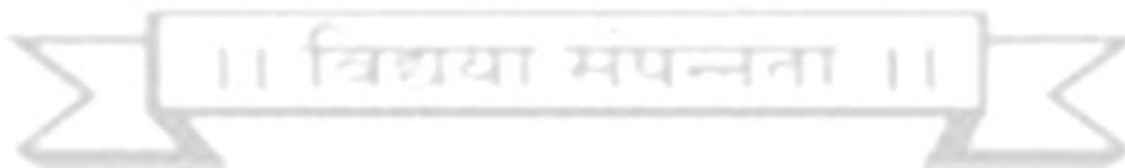
# Punyashlok Ahilyadevi Holkar Solapur University Solapur
## B.E. (INFORMATION TECHNOLOGY)
## SEMESTER - I
## IT 412: ADVANCED DATABASE SYSTEMS

| Teaching Scheme | Examination Scheme |
|---|---|
| Lectures : 4 Hours/week, 4 Credits | ESE - 70 Marks |
| Practical : 2 Hour/week, 1 Credit | ISE - 30 Marks |
| | ICA - 25 Marks |
| | POE: 50 Marks |

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**COURSE OBJECTIVES:**
1. To introduce distributed, parallel & object oriented databases
2. To study query processing and query optimization process.
3. To study data warehousing, data mining techniques and online analytical processing (OLAP)
4. To study Bigdata technologies.

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**COURSE OUTCOMES:**
At the end of the course students will be able to
1. Implement principles of distributed database and parallization techniques of Parallel database.
2. Apply OLAP to data to view data in multiple dimensions and data mining algorithms for predictions.
3. Apply query evaluation and query optimization algorithms.
4. Demonstrate big data technologies.

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## SECTION-I

### Unit 1 : Database System architectures                         (12 Hrs)
Centralized & C/S architectures, Server systems, Distributed systems, Distributed databases – homogeneous & heterogeneous databases, Distributed data storage, Distributed transactions, Commit protocols, Concurrency control in distributed databases, Availability, Distributed query processing, Heterogeneous distributed databases.

### Unit 2 : Parallel Databases                         (10 Hrs)
Introduction, I/O parallelism, Inter-query parallelism, Intra-query parallelism, Intra-operation parallelism, Inter-operation parallelism.

### Unit 3 : Data Analysis and Mining                         (10 Hrs)
Introduction to decision support, OLAP: Multidimensional Data Model, Multidimensional Aggregation Queries, Window Queries in SQL: 1999, Implementation Techniques for OLAP, Data Warehousing, Introduction to data mining, The knowledge Discovery Process, Counting co-occurrences, Mining for rules, Clustering, Similarity search over sequences.

**SECTION-II**

**Unit 4: Object Based Databases** (8 Hrs)
Overview, Complex Data Types, Structured Types and Inheritance in SQL, Table Inheritance, Array and Multisets Types in SQL, Object Identity and Reference Types in SQL, Object Oriented DBMS versus Object Relational DBMS.

**Unit 5: Query Processing & Optimization** (10 Hrs)
Overview of query processing, Measure of query cost, Selection Operation, Sorting, Join Operation, Other Operation, Evaluation of Expression, Overview of optimization, Transformation of Relational Expressions, Estimating Statistics of Expression Results, Choice of Evaluation plans.

**Unit 6: BIG data and HADOOP & No SQL** (10 Hrs)
Big data, characteristics of Big data, introduction to HADOOP, High level architecture of HADOOP, HDFS file system architecture, special feature of HADOOP, working with HAD OOP commands, working of MAP reduce with an example. Getting started with NoSQL, Key value stores, Document databases, New SQL, Postgre SQL.

**ICA:**

**Practical Assignments (minimum 10 to be implemented):**
1. Implement 2 PC protocol.
2. Implement join operation on n relations using parallelism approach.
3. Implement the Round Robin partitioning for parallel database environment.
4. Implement the Hash partitioning for parallel database environment.
5. Implement the Range partitioning for parallel database environment.
6. Implement Interquery parallelism in parallel databases.
7. Implementation of intraquery parallelism using multithreading
8. Implement Range partitioning Sort algorithm using intraquery parallelism through interoperation.
9. Implementation of Asymmetric fragment & replicate join
10. Write a program to join r1 ⊳⊲ r2 ⊳⊲ r3 ⊳⊲ r4 using Independent Parallelism for Inter-operation parallelism.
11. Implement OLAP queries.
12. Implement algorithm for finding Frequent Itemsets for a given minimum support.
13. Implement algorithm for finding association rules for given minimum support and confidence.
14. Implement queries in SQL: 1999 that work on Complex Data types, Array and Multisets.
15. Implement queries for type inheritance and table inheritance.

**Text Book :**
1) Data base System Concepts sixth Edition, by Abra ham Silberschatz, Henry F. Korth, S. Sudarshan, Sixth Edition, M cGraw Hill Publication.
2) Data base Management Systems Third Edition, by Raghu Ramakrishan and Johannes Gehrke, McGrawhill Education.
3) Mon goDB, The Definitive Guide, Kristina Cho dorow, Oreilly, Shroff Publishers and Distributors Pvt. Ltd., ISBN : 978-93-5110-269-4.

**Reference Books:**
1. Hadoop in Action, Chuck Lam, Dreamtech Press, ISBN : 97 8-81-7722-813-7.
2. Big Data & Hadoop, V.K. Jain, Khanna Publishing House

# Punyashlok Ahilyadevi Holkar Solapur University Solapur
## B.E. (INFORMATION TECHNOLOGY)
## SEMESTER - I
## IT413: SOFTWARE TESTING & QUALITY ASSURANCE

**Teaching Scheme**                                          **Examination Scheme**
Lecture: 3 Hours /Week, 3 Credits                            ESE-70 Marks
                                                             ISE - 30 Marks
                                                             ICA- 25 Marks
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## COURSE OBJECTIVES:
1. To gain knowledge of the software testing process, various methods of testing, levels of testing.
2. To study generation and execution of test plan, cases & scripts.
3. To get acquainted with software quality assurance approaches and standards/models.
4. To get acquainted with open source software testing tools.
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## COURSE OUTCOMES
At the end of the course students will be able to

1. Describe the various software testing types and select appropriate testing type.
2. Generate requirement based test cases by using black box and white box testing methods.
3. Demonstrate different approaches of Software Quality Assurance (SQA) and prepare SQA plan.
4. Use free open source software testing tools to test software.
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## SECTION – I

### Unit-1: Fundamentals of Software Testing                                      (6 Hrs)
Introduction, Basics of Software Testing, Approaches to Testing, Testing During Development Life Cycle, Essential of Software Testing, Features of Testing, Misconceptions About Testing, Principles of Software Testing, Test Policy, Defect Classification, Defect, Error, Mistake in Software, Defect Life Cycle, Defect Management Process, Developing Test Strategy, Developing Testing Methodologies.

### Unit-2: Methods of Testing                                                    (6 Hrs)
Software Verification and Validation, Black-Box and White-Box Testing, Static and Dynamic Testing, Black-Box Testing Techniques-Equivalence Partitioning, Data Testing, State Testing, Other Black Box Test Techniques. White-Box Testing Techniques-Data Coverage, Code Coverage, Other White Box Test Techniques.

### Unit-3: Levels of Testing                                                     (6 Hrs)
Levels of Testing, Proposal Testing, Requirement Testing, Design Testing, Code Review, Unit Testing, Module Testing, Integration Testing, Big-Bang Testing, Sandwich Testing.

### Unit-4: System Testing                                                        (6 Hrs))
GUI Testing, Compatibility Testing, Security Testing, Performance Testing, Volume Testing, Stress Testing, Load Testing, Installation Testing, Regression Testing, Smoke Testing, Sanity Testing, Ad hoc Testing, Usability Testing,Acceptance Testing-Alpha Testing, Beta Testing, Gamma Testing.

## Unit 5: Test Planning & Documentation (6 Hrs)
Test Planning-The goal of Test Planning, Test Planning Topics, Writing and Tracking Test Cases-The Goal of Test Case Planning, Test Case Planning Overview, Test Case Organization and Tracking, Reporting Bugs- Getting Your Bugs Fixed, Isolating and Reproducing Bugs.

## Unit 6: Quality Concepts & Software Quality Assurance (6 Hrs)
Quality Concepts-What is Quality?, Software Quality, The Software Quality Dilemma, Achieving Software Quality, Software Quality Assurance-Background Issues, Elements of Software Quality Assurance, SQA Processes and Product Characteristics, SQA Tasks, Goals and Metrics.

## Unit 7: Formal Approaches to SQA (5 Hrs)
Statistical SQA, Software Reliability, the ISO 9000 Quality Standards, CMM, the SQA Plan.

## Unit 8: Automated Testing and Testing Tools (4 Hrs)
Introduction, The Benefits of Automation and Tools, Test Tools, Software Test Automation, Random Testing, Realities of Using Test Tools and Automation Case Studies on Testing Tools-Selenium.

**Reference tutorials:**
1. Spoken Tutorials on Selenium Software Testing Framework at http://spoken-tutorial.org/tutorial-search/?search_foss=Selenium&search_language=English.

**Text books:**
1. Software Testing Principles, Techniques and Tools By M G Limaye, Published by Tata McGraw-Hill Education Private Limited, Published 2009, ISBN (13): 978-0-07-013990-9, ISBN (10): 0-07-013990-3 (Chapter 1 & 3).
2. Software Testing, Second Edition By: Ron Patton, Published by SAMS, ISBN-13: 978-0672327988 ISBN-10: 0672327988 (Chapter 2, 4 & 6).
3. Software Engineering: A Practitioner's Approach by Roger S Pressman, 8 th Edition, Publisher McGraw Hill (Chapter 5).

**Reference books:**
1. Software Testing Principle and Practices By Ramesh Desikan, Gopalaswamy Ramesh, Pearson Education, ISBN 978-81-7758-121-8.
2. Software Testing Principles and Practices By Naresh Chauhan, Publisher OXFORD UNIVERSITY PRESS-NEW DELHI, ISBN 0-19-806184-6.
3. Beautiful Testing: Leading Professionals Reveal How They Improve Software By Adam Goucher, Tim Riley, Publisher O'reilly.
4. Foundations of Software Testing By Rex Black, Dorothy Graham, Erik Van Veenendaal, Isabel Evans, Published by Cengage Learning India Pvt Ltd.

# Punyashlok Ahilyadevi Holkar Solapur University Solapur
## B.E. (INFORMATION TECHNOLOGY)
### SEMESTER - I
### IT414: MOBILE COMPUTING

**Teaching Scheme**                                           **Examination Scheme**

Lectures: 3 Hours/week, 3 Credits                               ESE – 70 Marks

Practical: 2 Hour/week, 1 Credit                                ISE – 30 Marks

ICA – 25 Marks

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### Course objective :
1. To get acquainted with basics of wireless and sensor network.
2. To introduce advanced concepts of GSM (3G, 4G).
3. To get in-depth knowledge of mobile communication system.

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### Course Outcome :
At the end of the course students will be able to

1. Demonstrate basics of wireless and sensor network.
2. Describe various modulation & multiplexing techniques and select appropriate for mobile communication.
3. Describe various layers in GSM communication and its working.

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## Unit1: Mobility                                                        ( 4 Hrs)

Introduction-Mobile communication, Applications, solutions, limitation, devices, network and Architecture; Mobile and Handheld Devices, Smart systems and limitations of Handheld Devices.

## Unit2: Principles of Wireless Communication                          (8 Hrs)

Signals, Antennas, Digital modulation techniques ,Linear modulation techniques ,Spread spectrum modulation ,Performance of modulation ,Multiple access techniques ,TDMA ,FDMA ,CDMA ,SDMA ,Overview of cellular networks ,Cellular concept ,Handoff strategies ,Path loss ,Fading and Doppler effect.

## Unit 3: Global System for 3G and 4G Mobile Communication (GSM) System Overview:        (8 Hrs)

GSM Architecture, Mobility Management, Network Signaling, GPRS ,WCDMA, Wi MAX, LTE, Mobility management and handover technologies.

## Unit 4:Mobile IP Networks                                              ( 6 Hrs)

Physical mobility, challenges, limits and connectivity, mobile IP (IPv4 ,IPv6) and cellular IP in mobile computing.

**SECTION II**

**Unit 5: Mobile Transport Layer:**                                               ( 3 Hrs)

Transport layer issues in wireless, Indirect TCP, Snoop TCP, Mobile TCP.

**Unit 6: Wireless LANs**:                                                              ( 8 Hrs)

Issues and challenges of wireless networks ,Location management ,Resource management ,Routing ,Power management ,Security ,Wireless media access techniques ,ALOHA ,CSMA ,Wireless LAN ,MAN ,IEEE 802.11 (a, b, e, f, g, h, i) ,Bluetooth.

**Unit 7: Mobile Ad-hoc Networks**:                                                (4 Hrs)

Mobile networks , Ad-hoc networks ,Ad-hoc routing ,Sensor networks ,Peer, Peer networks Mobile routing protocols ,DSR , AODV ,Reactive routing ,Location aided routing , Mobility models ,Entity based ,Group mobility ,Random way ,Point mobility model.

**Unit 8: Simulation**                                                                     (4 Hrs)

Designing and evaluating the performance of various transport and routing protocols of wireless networks and Ad-hoc networks using network simulator (any one).

**Text Book**:

1. Jochen Schiller Mobile Communication, Pearson Education
2. Raj Kamal, "Mobile Computing", Oxford University Press, 2007, ISBN: 0195686772.(ch 1,7)
3. U. Hansman and L. Merck. Principles of Mobile Computing", 2nd Ed., Springer

**References:**

1. A. S. Tanenbaum. Computer Networks, 4th Ed., Pearson Education.
2. Milojicic, F. Douglis. Mobility Processes, Computers and Agents", Addison Wesley.
3. Raj Kamal  Mobile Coomputing, Oxford University Press.
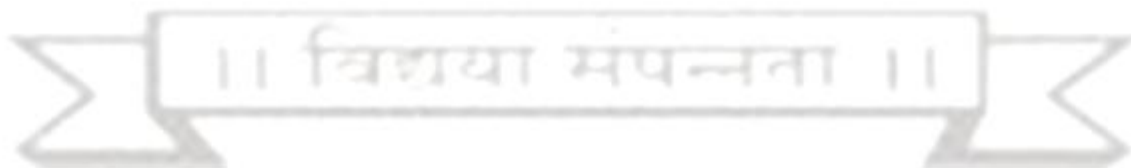
# Punyashlok Ahilyadevi Holkar Solapur University Solapur
## B.E. (INFORMATION TECHNOLOGY)
## SEMESTER - I
## IT 415A: ELECTIVE – I: DATA MINING

**Teaching Scheme**

Lecture: 3 Hours /week, 3 credits

**Examination Scheme**

ESE – 70 Marks

ISE – 30 Marks

ICA – 25 Marks

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## COURSE OBJECTIVES:
1. To discuss the need and usage of various data mining techniques
2. To study different data preprocessing techniques and apply them to given data
3. To study and compare data mining techniques
4. To identify the use of data mining algorithms for problem solving

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## COURSE OUTCOMES:
At the end of the course students will be able to

1. Apply data preprocessing methods for transforming raw data into interpretable format.
2. Compare various data mining techniques to discover patterns and relationships in data for decision making
3. Select an appropriate data mining algorithm to solve real world problem

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## SECTION- I

### UNIT 1: Introduction                                                                                  (6 Hrs)
Why data Mining, What is Data Mining?, Basic data mining tasks, What kind of Data can be mined, What kinds of Patterns can be mined?, technological support for data mining, target applications of data mining, major issues in data mining, KDD process ,Data mining Vs Knowledge Discovery in Databases.

### UNIT 2: Data Preprocessing                                                                          (8 Hrs)
Need to Preprocess the data, major tasks in Data Preprocessing, Data Cleaning, Data integration, Data Reduction, Data Transformation and Data Dicretization.

### UNIT 3: Classification                                                                                  (8 Hrs)
Issues in Classification, Statistical-Based Algorithms: Regression, Bayesian Classifiers. Distance Based Algorithms: K -Nearest Neighbors Classifiers, Decision Tree Based Algorithms, Neural Network-Based Algorithms, Rule Based Algorithms.

## SECTION II

**UNIT 4: Cluster Analysis- Basic Concept and Methods** (8 Hrs)
Cluster Analysis : What is Cluster Analysis?, Requirements for Cluster Analysis, Overview of Basic Clustering Methods.
**Partitioning Methods**: k-Means: A Centroid-Based Technique, k-Medoids: A Presentative Object-Based Technique.
**Hierarchical Methods**: Agglomerative Algorithms and Divisive Clustering, BIRCH: Multiphase Herarchical Clustering Using Clustering Feature Trees,  Evaluation of Clustering.

**UNIT 5: Association Rules** (8 Hrs)
Introduction, Large Item sets, Basic Algorithms:  Apriori Algorithm, Sampling Algorithm, Partitioning Algorithm, Parallel and Distributed Algorithms, Comparing Approaches, Incremental Rules, Advanced association rule-Techniques, Measuring the quality of rules.

**UNIT 6: Web Mining** (7 Hrs)
Introduction, Web Content Mining: Crawlers, Harvest System, Virtual Web View, personalization.
Web Structure Mining: PageRank, Clever.  Web Usage Mining: Preprocessing, Data Structures, Pattern Discovery Pattern Analysis.

**Text Books:**
1. Margaret H. Dunham, "DATA MINING Introductory and Advanced Topics", PEARSON (Units 3,5,6).
2. Han, Kamber, Pei,  "DATA MINING Concept and Techniques",  3$^{rd}$ Edition, ELSEVIER (Units 1,2,4).
3. Tan, Vipin Kumar, Steinbach , "Introduction to Data Mining" , PEARSON (Unit 3).

**Reference Books:**
1. Galit Shmueli, Nitin Patel, Peter Bruce, "Data mining For Business intelligence" Wiley Student Edition.
2. M.Berry and G. Linoff, "Mastering Data Mining", Wiley Student Edition.
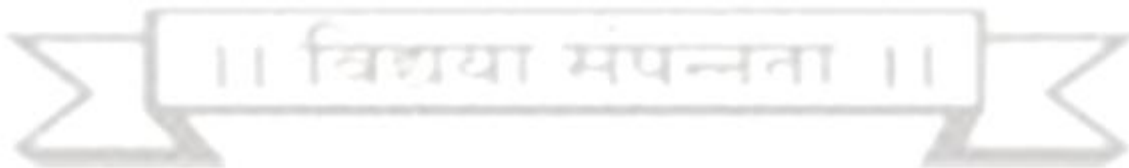
# Punyashlok Ahilyadevi Holkar Solapur University Solapur
## B.E. (INFORMATION TECHNOLOGY)
### SEMESTER - I
### IT 415B: ELECTIVE – I: IMAGE PROCESSING

**Teaching Scheme**                                          **Examination Scheme**
Lecture: 3 Hours /week, 3 credits                              ESE– 70 Marks
                                                               ISE  – 30 Marks
                                                               ICA –25 Marks

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## COURSE OBJECTIVES:
1. To make student realize different areas and applications of image processing.
2. To introduce to student low level image processing operations in spatial and frequency domain
3. To introduce to student preliminary methods for image analysis and description.
4. To make student understand the necessity of image compression and its related techniques.
5. To activate student's interest in computer vision and video processing applications.

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## COURSE OUTCOMES:
At the end of the course students will be able to

1. Enlist various application areas and applications of image processing.
2. Express low level operations in spatial and frequency domain.
3. Describe and derive for image analysis operations.
4. Differentiate between image representation & description operations.
5. Compare different image compression techniques.

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## SECTION- I

### UNIT 1:  Fundamentals of digital image processing                                      (8 Hrs)

Fields of use of digital image processing, fundamental steps in digital image processing, sampling & quantization, representation, spatial & intensity resolution, neighborhood, connectivity of pixels, distance measurement, matrix operations, spatial operations, and basics of transform domain, color image fundamentals, color models & conversion

### UNIT 2:  Image preprocessing                                                          (8 Hrs)

Basic intensity transformation functions, histogram processing, preprocessing in spatial domain, preprocessing in frequency domain, image smoothing and sharpening using spatial and frequency domain filters, image restoration in spatial domain & frequency domain, geometric transformations

### UNIT 3:  Image analysis                                                               (8 Hrs)

Edge detection, line detection, corner detection, boundary detection, Hough transform, thresholding, edge-based segmentation, region-based segmentation, template matching

## SECTION- II

## UNIT 4:  Image representation & description                    (8 Hrs)

Chain code, polygon approximation, signature, skeleton, shape number, Fourier descriptor,

 regional descriptors, texture and statistical texture description.

## UNIT 5 : Image transforms                                     (7 Hrs)

Discrete Fourier transform, discrete cosine transform, wavelet transform, singular value decomposition, principle component analysis.

## UNIT 6 : Image compression                                    (6 Hrs)

Transforms for image compressions, predictive compression, vector quantization, hierarchical & progressive compression, coding, JPEG & MPEG.

- **Text Books:**
    1. Digital Image Processing; R.C. Gonzalez, R.E. Woods; 2nd Edition; Pearson Education – Chapter 3, 4, 5.
    2. Digital Image Processing; R.C. Gonzalez, R.E. Woods; 2nd Edition; Pearson Education – Chapter 1.
    3. Digital Image Processing & Computer Vision; Milan Sonka, Vaclav Hlavac, Roger   Boyle; Cengage Learning – Chapter 2, 3, 4, 5, 6.

- **Reference Books:**
    1. Fundamentals of Digital Image Processing – Anil K. Jain; 2nd Edition; Prentice Hall, Englewood cliffs, NJ.
    2. Image Processing: The Fundamentals – Maria Petrou; 2nd Edition; John Wiley.

- **Assignments (preferably using Scilab):**

    1. Handling and displaying images

    2. Displaying Fourier transform of the image

    3. Analyzing magnitude and phase spectrum of Fourier transform of an image

    4. Image enhancement using histogram equalization

    5. Filtering image in the  spatial domain

    6. Filtering image in the frequency domain

    7. Edge detection

    8. Corner detection

    9. Line detection using Hough transform

    10. Image segmentation

    11. Vector quantization based image compression

    12. JPEG based image compression

# Punyashlok Ahilyadevi Holkar Solapur University Solapur
## B.E. (INFORMATION TECHNOLOGY)
## SEMESTER - I
## IT 415C: ELECTIVE-I: DISTRIBUTED COMPUTING

**Teaching Scheme**
Lecture: 3 Hours /Week, 3 Credits

**Examination Scheme**
ESE – 70 Marks
ISE – 30 Marks
ICA – 25 Marks

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## COURSE OBJECTIVES:
1. To introduce fundamentals of distributed computing.
2. To study various algorithms of process management & synchronization, for inter process communication.
3. To study mutual exclusion and deadlock detection.
4. To study to use distributed file System in distributed applications.

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## COURSE OUTCOME:
At the end of the course students will be able to
1. Describe fundamentals of distributed computing and its various models to select appropriate.
2. Use process management & synchronization algorithms for inter process communication.
3. Analyze working of mutual exclusion and deadlock detection in distributed computing.
4. Use of Distributed File System in Distributed application.

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## SECTION – I

### Unit 1 : Fundamentals                                                                   (4 Hrs)
Fundamentals of OS, What is Distributed System? Evolution of Distributed Computing System, Distributed Computing System Models , Distributed Computing Gaining Popularity, Issues in Designing Distributed System, Introduction to Distributed Computing Environment, Protocols for Distributed Systems – FLIP and VMTP.

### Unit 2: Message Passing                                                                  (6 Hrs)
Introduction, Desirable features of Good Message-Passing System, Issues in IPC by Message Passing, Synchronization, Buffering, Multidatagram Messages, Encoding and Decoding of Message Data, Process Addressing, Failure Handling, Group communication, Case Study: RMI, CORBA.

### Unit 3: Remote Procedure Calls                                                           (6 Hrs)
Introduction, The RPC Model, Transparency of RPC, Implementing RPC mechanism, Stub Generation, RPC Messages, Marshalling Arguments and Results, Server Management, Parameter-Passing Semantics, Call Semantics, Communication Protocols for RPCs, Client-Server Binding, Exception Handling, Security.

### Unit 4: Synchronization in Distributed Systems                                           (6 Hrs)
Introduction, Process Migration, Threads, Clock Synchronization, Event Ordering, Mutual Exclusion, Deadlock, Election Algorithms, Issues in Designing Distributed System and role of middleware in Distributed System.

**Unit 5: Distributed Mutual Exclusion** (5 Hrs)

Introduction, Classification of Mutual Exclusion Algorithms, Preliminaries, A simple solution to Distributed Mutual Exclusion, Non-Token-Based Algorithms, Lamport's Algorithm, The Ricart-Agrawala Algorithm, Token-Based Algorithms, Suzuki-Kasami's Broadcast Algorithms.

**Unit 6 : Distributed Deadlock Detection** (6 Hrs)

Introduction, Preliminaries, Deadlock handling strategies in Distributed Systems, Issues in Deadlock Detection and Resolution, Control organizations for distributed deadlock detection, Centralized deadlock detection algorithms, Distributed deadlock detection algorithms, Avoidance and Prevention algorithms, Hierarchical deadlock detection algorithms.

**Unit 7 : Distributed File Systems** (6 Hrs)

Distributed Resource Management, Concepts of File System, Distributed File Systems - Introduction, Architecture, Mechanisms for building Distributed File System, Design issues, Log-Structured file systems, Case studies - Google FS.

**Unit 8 : Distributed Shared Memory** (6 Hrs)

Introduction, Architecture and Motivation, Algorithms for implementing DSM, Memory Coherence, Coherence Protocols, Design issues, Case studies-Linda.

**ICA:** It should consist of the following assignments:
1. Implementation of RMI for any given application.
2. Implementation of RPC for any given application.
3. Implementation of Communication Protocol of RPC (R, RR, RRA Protocol).
4. Implementation of different sorting algorithms using dispatcher thread model.
5. Implementation of logical clocks by using Counters.
6. Implementation of logical clocks by using Physical clocks.
7. Implementation of Mutual Exclusion by using Token-Passing approach.
8. Implementation of Stateful and Stateless server in file reading application.
9. Implementation of Deadlock Detection Algorithm.
10. Implementation of Bully Algorithm.
11. Implementation of Ring Algorithm.
12. Study of HDFS- Hadoop Distributed File System

**Text books:**
1. Distributed O.S Concepts and Design, P.K.Sinha, PHI (Unit 1, 2, 3, 4).
2. Advanced concepts in Operating Systems, Mukesh Singhal & N.G.Shivaratri, TMH ( Unit 5,6,7,8 ).
3. Distributed Computing, Sunita Mahajan, Seema Shah, OXFORD University Press (Unit 1, Case studies 7, 8).

**Reference Books:**
1. Distributed System Principles and Paradigms, Andrew S. Tanenbaum, 2nd edition, PHI
2. Distributed Systems, Colouris, 3$^{rd}$ Edition.

## Punyashlok Ahilyadevi Holkar Solapur University Solapur

### B.E. (INFORMATION TECHNOLOGY)
### SEMESTER - I
### IT 415D ELECTIVE – I: MICROCONTROLLER AND EMBEDDED SYSTEMS

**Teaching Scheme**                                                  **Examination Scheme**
Lectures: 3 Hours /week, 3 credits                                   ESE – 70 Marks
                                                                     ISE – 30 Marks
                                                                     ICA – 25 Marks


**COURSE OBJECTIVES:**

**1**.     To acquaint students with the applications of Microprocessors and Microcontrollers
           in embedded system.
2.     To get acquainted with the programming techniques used in microcontroller.
3.     To study interfacing of real world input and output devices.
4.     To get acquainted with the basics of embedded systems and the fundamentals of real time
operating system (RTOS).

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**COURSE OUTCOME:**
At the end of the course students will be able to
   1. Learn importance of microcontroller in designing embedded application.
   2. Program microcontroller and design conceptual embedded system.
   3. Develop interfacing to real world devices.
   4. Design and Simulate a microcontroller based embedded system.
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### SECTION – I


**Unit 1: Microprocessors and microcontroller.**                              **(5 Hrs)**
Introduction, Microprocessors and Microcontrollers, RISC & CISC CPU Architectures, Harvard &
Von-Neumann CPU architecture, Computer software. The 8051 Architecture, Pin diagram of 8051,
Memory organization, External Memory interfacing, stacks.

**Unit 2: Assembly Language Programming of 8051.**                            **(12 Hrs)**
Introduction, Instruction syntax, Data types, Subroutines, Addressing modes; 8051 instructions: Data
transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Subroutine
instructions, Bit manipulation instruction; Assembler directives, Assembly language programs and
Time delay calculations. 8051 interrupt structure, 8051 timers/counters, 8051 Serial Communication.

**Unit 3: 8051 Interfacing and Applications**
Interfacing 8051 to LCD, Keyboard, parallel and serial ADC, sensor interfacing.          **(4 Hrs)**

**Unit 4: Typical Embedded System** (6 Hrs)

What is an embedded system, Major application areas and purpose of embedded systems, Core of the Embedded System, Memory, Sensors and Actuators, Communication Interface, Embedded Firmware, Other System Components, Characteristics and Quality Attributes of Embedded Systems.

**Unit 5: Hardware Software Co-Design and Program Modelling** (5 Hrs)

Fundamental Issues in Hardware Software Co-Design, Computational Models in Embedded Design, Introduction to Unified Modelling Language, Hardware Software Trade-offs.

**Unit 6:Real-Time Operating System (RTOS) based Embedded System Design** (11 Hrs)

Operating System Basics, Types of OS, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling, Threads, Processes and Scheduling: Putting them altogether, Task Communication, Task Synchronization, Device Drivers, How to Choose an RTOS.

**Unit 7:   Embedded System - Design case studies** (2 Hrs)

Digital clock, Digital camera, Battery operated smart card reader, automated meter reading system.

**TEXT BOOKS:**

1.  "The 8051 Microcontroller and Embedded Systems – using assembly and C "-, Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinlay; PHI, 2006 / Pearson, 2006

2.  "The 8051 Microcontroller",  V.Udayashankar and MalikarjunaSwamy, TMH, 2009

3.  Introduction to Embedded Systems:Shibu K V, Tata McGraw Hill Education Private Limited, 2009
    **REFERENCE BOOKS**:

    1.   "The 8051  Microcontroller Architecture, Programming  & Applications", 2e Kenneth J. Ayala
 2.   " Microcontrollers: Architecture, Programming, Interfacing and System Design",RajKamal, Pearson Education, 2005.

 3.  David E. Simon,"An Embedded Software Primer",Addison Wesley,1999.
 4.   https://www.labcenter.com/

**Assignments**

1. Introduction to Proteus Software.
2. Simulating LED Blinking using 8051 in Proteus.
3. To create a series of moving lights using 8051 on LED's.
4. To interface the seven segment display with microcontroller 8051 in Proteus.
5. To interface the stepper motor with microcontroller in Proteus.
6. Design and simulate digital clock circuit in Proteus.
7. Digital Lock Security system in Proteus.

# Punyashlok Ahilyadevi Holkar Solapur University Solapur
## B.E. (INFORMATION TECHNOLOGY)
## SEMESTER - I
## IT416: C#.Net

**Teaching Scheme**

Lectures: 2 Hours /week, 2 credits

Practical: 2 Hours /week, 1 credit

**Examination Scheme**

ISE – 25 Marks

POE– 50 Marks

ICA – 25 Marks

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## COURSE OBJECTIVES:
1. To revisit Object Oriented Programming features.
2. To get acquainted with file handling operations and Exception handling.
3. To study to develop Windows Forms with C# and Web applications through ASP.NET and/or ADO.NET.

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## COURSE OUTCOMES:
At the end of the course students will be able to
1. Demonstrate object oriented programming features with C#
2. Implement file handling operations.
3. Handle exceptions in C# programs
4. Develop Windows Applications with C#
5. Develop Web applications through ASP.NET and/or ADO.NET

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## SECTION- I

### Unit 1: Introduction to .NET Framework                                                    (2 Hrs)
The .NET architecture, The common language runtime (CLR), Microsoft intermediate Language code (MSIL), Just in time Compliers, The framework class library, The common language specification, common language type system (CTS), Introduction to Visual Studio.NET and Sharp Develop IDE.

### Unit 2: C# Application Basics and Language fundamentals                     (4 Hrs)
Creating and compiling C# programs using command line compiler (csc.exe), Creating applications using IDEs, Namespaces, the "using" keyword, Basic data types, Operators, Flow control and conditional statements, loops, Arrays, Classes and Objects, Constructor overloading, Methods, Fields, Properties, Access Modifiers and Accessibility Levels, Static methods and fields, Garbage Collection, Structures, Nested Classes, String Manipulations, Naming Conventions, Java vs. C#

### Unit 3: Object Oriented Concepts and Exception Handling using C#          (4 Hrs)
Objects and Reference Types, Inheritance, Interfaces and Abstract Classes, Polymorphism, the "virtual" and "override" keyword, the "base" keyword, the "sealed" keyword, The Object Class, the "new" keyword in context of method overriding, Type Casting: Up casting and Down casting, the "is" and "as" keywords, Boxing and Unboxing.
Need for Exceptions, Exception Hierarchy and Handling Exceptions using try-catch-finally blocks, creating and defining Custom Exceptions, the "throw" keyword.

**Unit 4: Events, Delegates and Multithreading**                    **(4 Hrs)**
Events and Delegates in C#, Multicast Delegate, Event Handling.
What is Multithreading, Multithreading in C#, Static and Instances members of Thread Class, Basic Thread operations, Thread priorities, Thread Synchronization.


## SECTION- II

**Unit 5: File System and Streams**                                 **(4 Hrs)**
Streams and System.IO namespace, Console IO, Reading writing and updating files and directories, System.IO.FileInfo Class, Serialization and Deserialization.

**Unit 6: GUI Programming in C#**                                   **(4 Hrs)**
Windows Forms and System Windows, Form namespace, Building Windows Forms,Applications using IDE, Windows Form controls , Event Handling , List Box , Combo Box, Tree View, File Dialog, Tool Bar, Windows standard Dialog Boxes, Menu Bar, GDI+ Graphics: Drawing Lines ,shapes and images.

**Unit 7: Data access using ADO.NET**                               **(4 Hrs)**
Introduction to ADO.NET, System Data namespace, Data Set, Data Table, Data Row, Data Column and other prominent classes, Accessing and Updating Data using ADO.NET.

**Unit 8: Introduction ASP.NET**                                    **(4 Hrs)**
Introduction to ASP.NET, State management in ASP.NET, ASP.NET Web Forms, Server Controls, Web application configuration, Creating Web applications using ASP.NET and C#.


**Textbooks:**
1. Professional C#, 3rd Edition -Simon Robinson, Christian Nagel, Karli Watson, Jay Glynn,   Morgan Skinner, Bill Evjen, Wrox Press - Wiley India.
2. Programming in C#: A Primer 3 Edition -E Balagurusamy, Tata McGraw - Hill Education


**Reference Books:**
1. C# Language Specification Version 5.0 Microsoft. (E-Resource available at http://www.microsoft.com)
2. C# Programming Guide MSDN, Microsoft. (http://msdn.microsoft.com/en-US/) 3 Microsoft Visual C# Step by Step 2010 - John Sharp, Microsoft Press.

**List of Assignments:**

1. Study of .Net framework.
2. Implementation of C# applications based on language fundamentals.
3. Implementation of C# applications based on Inheritance.
4. Implementation of C# applications based on Polymorphism, Type Casting, Boxing and Unboxing.
5. Implementation of C# applications based on Exception Handling.
6. Implementation of C# applications based on Delegates.
7. Implementation of C# applications based on Multithreading.
8. Implementation of C# applications to perform I/O Operations.
9. Design Windows Forms using various controls, GDI+ Graphics.
10. Implementation of ASP.NET & ADO.NET applications
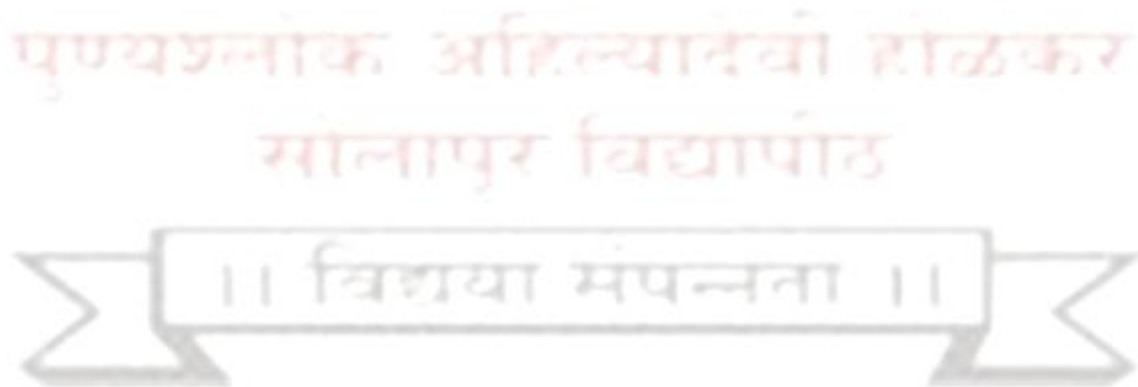
**Punyashlok Ahilyadevi Holkar Solapur University Solapur**
**B.E. (INFORMATION TECHNOLOGY)**
**SEMESTER - I**
**IT417: PROJECT-I**

**Teaching Scheme**                                                    **Examination Scheme**
Practical: 4 Hours /week, 2 credits                                     ICA– 75 Marks
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**COURSE OBJECTIVES:**

1. To guide students to explore research areas and to undertake literature survey.
2. To identify & formulate a realistic problem statement.
3. To follow an appropriate designing technique for further development of project.
4. To prepare to work in a team and to understand importance of teamwork.
5. To develop soft skills including presentation, writing & convincing.
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**COURSE OUTCOMES:**

At the end of the course students will be able to
1. Explore research areas, conduct literature survey and formulate a problem statement catering societal/professional need.
2. Select an appropriate design with due consideration for society.
3. Carry out impact analysis for environment and sustainability concern.
4. Prepare Software requirement specification (SRS) & design document using software engineering techniques and modern tools.
5. Engage in team work and communicate effectively while observing professional ethics.
6. Inculcate habit of self study to become a lifelong learner.
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**Strategy:**

1. Student will finalize his project with the guide and submit a synopsis with presentation.
2. Student should apply appropriate SDLC steps & prepare the project design.
3. Student should prepare a Project report which should preferably contain abstract, literature survey, problem definition, proposed system & design.
4. Student will have to give a seminar on the design of the project.
5. Project will be assessed by a panel of teachers appointed as guides at the institute level.

**IT418 - Vocational Training**

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**COURSE OBJECTIVES:**
1. To get acquainted with the industry environment.
2. To acquire in-depth knowledge of software development tools and technique to solve real world problems.
3. To study to exhibit professional & ethical responsibilities.

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**COURSE OUTCOMES**:

At the end of the course students will be able to

1. Use software development tools and techniques for real world problem.
2. Effectively communicate a vocational training report in writing and oral presentation.
3. Exhibit professional & ethical responsibilities.
4. Assimilate knowledge, skills and professional practices.

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**Strategy:**

1. Vocational Training of minimum 15 days shall be completed in any vacation after S.E. Part-II but before B.E. Part-I & the report shall be submitted and evaluated in B.E. Part-I

2. Training will be done individually.

3. Project based on training will be completed at industry or followed by training at institute.

4. The project work will be evaluated by industry person and certificate of completion will be provided by industry.

5. Vocational report should be submitted along with completion certificate to the institute.

Term work will be jointly assessed by a panel of teachers appointed by head of the department in consultation with industry person.

# Punyashlok Ahilyadevi Holkar Solapur University Solapur
## B.E. (INFORMATION TECHNOLOGY)
## SEMESTER - II
### IT 421: INFORMATION RETRIEVAL

**Teaching Scheme**                                          **Examination Scheme**

Lectures: 4 Hours /week, 4 credits                               ESE – 70 Marks

Practical: 2 Hours /week, 1 credit                               ISE – 30 Marks

                                                                 POE – 50 Marks

                                                                 ICA – 25 Marks

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### COURSE OBJECTIVES:

1. To get acquainted to information retrieval process and various information models.
2. To evaluate the performance of information retrieval systems.
3. To search text using sequential searching & pattern matching algorithms and various indexing structures.
4. To differentiate between data, information and multimedia retrieval systems.
5. To study different components of search engine and ranking algorithms.

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### COURSE OUTCOMES:

At the end of the course students will be able to

1. Implement classic text and structured retrieval models and evaluate the performance of information retrieval systems.
2. Build different indexing structure like inverted index, hash files, suffix arrays for given collection of documents.
3. Use different sequential searching algorithms and pattern matching algorithms to search in text.
4. Implement multimedia IR system and indexing on multimedia data.
5. Apply different ranking algorithms to find ranking of the documents.

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### SECTION – I

**1. Introduction**                                                                 (**7 Hrs**)

Information retrieval vs. data retrieval, User Task, Logical View of the documents, Information retrieval process, Text Operations: Introduction, document pre-processing, Document Clustering, Text Compression, Comparing text compression techniques.

**2. Information Retrieval Models & Performance Evaluation**               (**10 Hrs**)

A Formal Characterization of IR Models, Classic Information Retrieval, Structured Text Retrieval Models, Models for Browsing, Recall and Precision, Alternative measures.

**3. Query Languages**                                                              (**8 Hrs**)

Keyword based querying, Pattern Matching, Structural Queries, Query Protocols, Query operations.

**4. Indexing and Searching**                                                      (**10 Hrs**)

Inverted Files and Indices for text search, Boolean Queries, Sequential searching, Pattern Matching, Structural Queries.

**SECTION– II**

**5. Multimedia IR - Models and Languages** (**9 Hrs**)
Data Modelling & Query Languages, Indexing and searching.


**6. Multimedia IR - Indexing and Searching** (**6 Hrs**)
Spatial Access Methods, A generic multimedia indexing approaches, One dimensional time series, Two Dimensional color images, Automatic Feature Extraction.

**7. Web Retrieval** (**10 Hrs**)
Search Engine architecture, User interfaces, Ranking, Web Crawling, Browsing, Metasearchers, and Searching using Hyperlinks.


**Text Book -**
1. Modern Information Retrieval - Ricardo Baeza-Yates and Berthier Ribeiro-Neto - Pearson Education (Low Price Edition).

**Reference:**
1 www.dcc.ufmg.br/irbook or sunsite.dcc.uchile.cl/irbook.
2 http://nlp.stanford.edu/IR-book/information-retrieval-book.html.
3 Information Storage and Retrieval- Robert R Korthage, WILEY-INDIA.


**Assignments:**

1. Study of different search engines
2. Creation of logical Views of documents
3. Implementation of IR system using Boolean model.
4. Implementation of IR system using Vector model
5. Implementation of IR system based on pattern matching.
6. Searching using inverted index (construction & Searching)
7. Sequential searching using Brute Force Algorithm
8. Sequential searching using Knuth-Morris-Pratt Algorithm
9. Sequential searching using Boyer- Moore Algorithm
10. Sequential searching using BDM (Backward DAWG Matching) Algorithm.
11. Sequential searching using Shift-OR Algorithm
12. Approximate matching using dynamic Programming
13. Implementation of Multimedia Information Retrieval System

# Punyashlok Ahilyadevi Holkar Solapur University Solapur
## B.E. (INFORMATION TECHNOLOGY)
## SEMESTER - II
## IT422: MACHINE LEARNING

**Teaching Scheme**                                    **Examination Scheme**
Lecture: 3 Hours /Week, 3 Credits                      ESE – 70 Marks
Practical: 2 Hours /Week, 1 Credits                    ISE – 30 Marks
                                                       ICA - 25 Marks

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## COURSE OBJECTIVES:

1. To introduce various types of machine learning algorithms.
2. To enable designing of a model selecting appropriate machine learning algorithms for a given problem.
3. To study methods to validate previously designed machine learning models.
4. To introduce methods to evaluate and tune machine learning models.

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## COURSE OUTCOMES:

At the end of the course students will be able to

1. Demonstrate types of machine learning algorithms.
2. Design a model by selecting appropriate machine learning algorithm for a given problem.
3. Validate designed machine learning model.
4. Evaluate and tune machine learning model based on various parameters.
5. Design various applications using machine learning algorithm.

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## SECTION I

**Unit 1: Introduction to Machine learning** (4 Hrs)
**Understanding Machine Learning:** What Is Machine Learning?, Leveraging the Power of Machine Learning, The Roles of Statistics and Data Mining with Machine Learning, Putting Machine Learning in Context.
**Applying Machine Learning:** Getting Started with a Strategy, Applying Machine Learningto Business Needs,Understanding Machine Learning Techniques, Tying Machine Learning Methods to Outcomes.

**Unit 2: Offerings of Machine learning** (4 Hrs)
**Looking Inside Machine Learning:** The Impact of Machine Learning on Applications,Data Preparation, The Machine Learning Cycle.
**Getting Started with Machine Learning:** Understanding How Machine Learning Can Help, Focus on the Business Problem, Requirement of Collaboration in Machine Learning, Executing a Pilot Project, Determining the Best Learning Model.

**Unit 3: Basic mathematics for Machine Learning** (10 Hrs)
**Getting Started With The Math Basics:** Working with Data, Exploring the World of Probabilities, Describing the Use of Statistics, Interpreting Learning As Optimization, Exploring Cost Functions, Descending the Error Curve, Updating by Mini-Batch and Online.

# SECTION II

**Unit 4: Validating Machine Learning Models**            **(12 Hrs)**
**Validating Machine Learning:** Checking Out-of-Sample Errors, Getting to Know the Limits of Bias, Keeping Model Complexity in Mind and Solutions Balanced, Training, Validating, and Testing, Resorting to Cross-Validation. Looking for Alternatives in Validation. Optimizing Cross-Validation Choices, Avoiding Sample Bias and Leakage Traps, Discovering the Incredible Perceptron,
**Simplest learning strategies to learn from Data:** Discovering the Incredible Perceptron, Growing Greedy Classification Trees, Taking a Probabilistic Turn

**Unit 5: Improving Machine Learning Models**            **(10 Hrs)**
**Improving Machine Learning Models:** Studying Learning Curves , Using Cross-Validation Correctly , Choosing the Right Error or Score Metric , Searching for the Best Hyper-Parameters , Testing Multiple Models , Averaging Models , Stacking Models, Applying Feature Engineering , Selecting Features and Examples , Looking for More Data .

**Unit 6: Applications of Machine Learning**            **(5 Hrs)**
**Applying Learning to Real Problems:** Classifying Images, Scoring Opinions and Sentiments, Recommending Products and Movies, Using Machine Learning to Provide Solutions to Business Problems. **Future of Machine Learning.**

**Text Books:**
1) Machine Learning For Dummies, IBM Limited Edition by Judith Hurwitz,  Daniel Kirsch (Published by Wiley, First edition).
2) Machine Learning For Dummiesby John Paul Mueller , Luca Massaron (Published by For Dummies; First edition).

**Reference Books:**
1) Machine Learning by Tom M. Mitchell (Publisher: McGraw Hill Education; First edition + New Chapters from Second edition).

**Teamwork:**
Minimum 8 to 10 assignments requiring students to design implement and validate machine learning models using either R or Python scripts or any other machine learning toolkits and frameworks like MATLAB, Octave.

# Punyashlok Ahilyadevi Holkar Solapur University Solapur
## B. E. (INFORMATION TECHNOLOGY)
### SEMESTER – II
### IT423- INFORMATION ASSURANCE AND SECURITY

**Teaching Scheme**                                                    **Examination Scheme**
Lecture: 4 Hours /Week, 4 Credits                                      ESE – 70 Marks
                                                                       ISE–  30 Marks
                                                                       ICA – 25 Marks

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## COURSE OBJECTIVES:

1. To introduce fundamentals of Network Security Model and Cryptography.
2. To acquire knowledge of standard Cryptography Algorithms.
3. To get familiarized with various network security protocols to protect against threat.
4. To showcase IP Security Architecture at Network and Transport Layer for identifying the vulnerability of the Internet systems and recognize the mechanisms of the attacks.
5. To get familiarized with various tools and methods used in cyber crime and law acts.

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## COURSE OUTCOMES:
At the end of the course students will be able to

1. Describe classical encryption techniques and cyber laws within the context of cyber security.
2. Identify working principles of secret key and public key cryptography.
3. Demonstrate Network and Transport layer communication standards/protocols for web security.
4. Apply network security principles, authentication mechanism for secure data transmission.
5. Select appropriate security service/s to prevent, detect and/or recover from a security attack.

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## SECTION I

**Unit 1: Security Fundamentals**                                                    (8 Hrs)
**Computer Security Concepts:** The OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms, a Model for Network Security. **Classical Encryption Techniques:** Symmetric Cipher Model, Cryptography. **Substitution Techniques:** Caesar Cipher, Monoalphabetic Ciphers, Playfair Cipher ,Hill Cipher , Polyalphabetic Ciphers , **Transposition Techniques** , Rotor Machines , Steganography

**Unit 2: Block Ciphers and the Data Encryption Standard**                           (8 Hrs)
**Traditional Block Cipher Structure:** Stream Ciphers and Block Ciphers, Motivation for the Feistel Cipher Structure, The Feistel Cipher The **Data Encryption Standard:** DES Encryption, DES Decryption, The Strength of DES. **Public-Key Cryptography and RSA :** Principles of Public Key Cryptosystems, RSA: Description of the Algorithm , Computational Aspects , The Security of RSA.

**Unit 3: Key Management and Distribution**                                          (7 Hrs)
Symmetric Key Distribution Using Symmetric Encryption , Symmetric Key Distribution Using Asymmetric Encryption , Distribution of Public Keys , X.509 Certificates , Public-Key Infrastructure .

**Unit 4: Network and Internet Security** (8 Hrs)
**Network Access Control and Cloud Security:** Network Access Control, **Extensible** Authentication Protocol, IEEE 802.1X Port-Based Network Access Control Cloud Computing, Cloud Security Risks and Counter measures, Data Protection in the Cloud, Cloud Security as a Service.
**Transport-Level Security:** Web Security Considerations, Secure Sockets Layer, Transport Layer Security HTTPS, Secure Shell (SSH) .

## SECTION II

**Unit 5: Wireless Network Security** (7 Hrs)
Wireless Security 559, Mobile Device Security, IEEE 802. Wireless LAN Overview, IEEE 802. Wireless LAN Security, Electronic **Mail & IP Security:** Pretty Good Privacy, S/MIME,
**IP Security:** IP Security Overview, IP Security Policy, Encapsulating Security Payload.

**Unit 6: IP Security** (7 Hrs)
IP Security Overview, IP Security Policy, Encapsulating Security Payload, Combining Security Associations, **Internet** Key Exchange.

**Unit 7: Introduction to Cybercrime** (8 Hrs)

Introduction , Cybercrime: Definition and Origins of the Word , Cybercrime and Information Security, Who are Cybercriminals?, Classifications of Cybercrimes, Cybercrime: The Legal Perspectives, Cybercrimes: An Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes, Cybercrime Era: Survival Mantra for the Netizens, **Cyber Offenses:** How Criminals Plan Them , Introduction, How Criminals Plan the Attacks, Social Engineering, Cyber stalking, Cybercafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Cloud Computing.

**Unit 8: Tools and Methods Used in Cybercrime** (7 Hrs)

**Introduction:** Proxy Servers and Anonymizers , Phishing Password Cracking Keyloggers and Spywares ,
Virus and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDoS Attacks , SQL Injection, Buffer Overflow, Attacks on Wireless Networks,Phishing and Identity Theft, Introduction, Phishing, Identity Theft (ID Theft) ,Cybercrimes and Cybersecurity: The Legal Perspectives : Introduction , Cybercrime and the Legal Landscape around the World , Why Do We Need Cyberlaws: The Indian Context, The Indian IT Act, Challenges to Indian Law and Cybercrime Scenario in India, Consequences of Not Addressing the Weakness in Information Technology Act

**Text Books:**
 1. Willaim Stallings, "Computer Security: Principles and Practices", Pearson Ed. ISBN :978-81-317-3351-6 (Chapter 1,3)
 2. Bernard Menezes, "Network Security and Cryptography", Cengage Learning, ISBN-978-81-315-1349-1 (Chapter 2,3,4,7)
3.Nina Godbole, "Cyber Security-Understanding Cyber crimes Computer Forensics and Legal Perspectives" (Chapter 6)
**Reference Books:** 1. Nina Godbole, "Information Systems Security", Wiley India Pvt Ltd, ISBN -978-81-265-1692-6
**Assignments: These assignments have to be written in Journal with report and snapshots of tools.**

1. Study and Implementation of Encryption Techniques.

2**.** Study and Implementation of Cryptography Algorithm.

3. Case Study: Study of Firewall (College Network or any organization)

4. Case Study: Study of Intrusion Detection system /Tool.

5. Configure and demonstrate use of IDS tool such as snort.

6. Configure and demonstrate use of recent free Traffic monitoring tool with security perspective.

7. Configure and demonstrate use of vulnerability assessment tool such as NESSUS

8. Case study: Study of Email Spoofing Instances.

9. Case Study: Mini Cases in Cybercrime (Financial Frauds, Hacking, Credit card frauds).
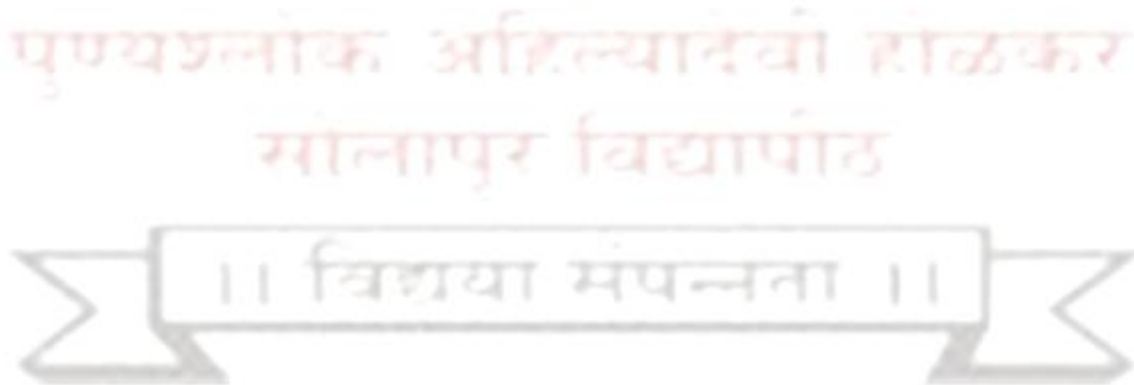
# Punyashlok Ahilyadevi Holkar Solapur University Solapur
## B.E. (INFORMATION TECHNOLOGY)
## SEMESTER - II
## IT 424A ELECTIVE – II: BUSINESS INTELLIGENCE

| Teaching Scheme | Examination Scheme |
|---|---|
| Lectures: 3 Hours /week, 3 Credits | ESE – 70 Marks |
| Tutorial: 2 Hours /week, 2 credits | ISE – 30 Marks |
| | ICA – 25 Marks |

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## COURSE OBJECTIVE:

1. To introduce to business intelligence environment with its architecture, components and applications.
2. To enable students to apply data mining techniques for data analysis.
3. To get acquainted with decision support systems and BI tools.

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## COURSE OUTCOME:

At the end of the course students will be able to
1. Describe the basic components of Business Intelligence (BI) environment.
2. Apply data mining techniques for various applications.
3. Use ETL and Business Intelligence Tools.
4. Demonstrate various applications of BI / use marketing models to increase profitability of enterprise.

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## SECTION – I

### Unit 1 : Introduction to Business Intelligence: (8 Hrs)
Effective and timely decisions, role of mathematical models, BI architectures, ethics on BI. Introduction to data warehouse, architecture, OLAP.

(7 Hrs)
### Unit 2 : Decision Support System:
Representation of decision making system, evolution of information system, definition and development of decision support system, mathematical models for decision making.

### Unit 3 : Analysis of Data Mining: (10 Hrs)
Definition and applications of data mining, data mining process, analysis methodologies, data preparation, data validation, data transformation, data reduction, data exploration, Univariate analysis, Bivariate analysis, Multivariate analysis.

**SECTION – II**

**Unit 4: Machine learning and Data analysis:**

Regression, simple and multiple regressions, validation of regression models, time series, evaluating and analysis of time series, exponential smoothing models, autoregressive models,

**Unit 5: Data mining Techniques for BI:** **(10 Hrs)**

classification and its problems, evaluating classification models, classification trees, Bayesian methods, neural networks, structure of association rules, Apriori algorithm, general association rules, clustering methods, partition methods and hierarchical methods.

**Unit 6: Business Intelligence Applications:** **(10 Hrs)**

Marketing models: Relational marketing, Salesforce management, Business case studies, supply chain optimization, optimization models for logistics planning, revenue management system, Logistics business case studies.

**Text Book:**

1. Business Intelligence Data mining and optimization for Decision making by Carlo Vercellis, ISBN: 978-81-265-4188-1, Wiley Publication.

2. Data Mining and Business Intelligence by S.K. Shinde and Uddagiri Chandrashekhar.

**Reference Books:**

1. Data Warehousing in the Real World – Anahory & Murray, Pearson Edt.
2. Data Warehousing Fundamentals – Ponniah [Wiley Publication].

Term work assessment shall be a continuous process based on student's performance in – class tests, assignments, homework, subject seminars, quizzes, laboratory books and their interaction during theory.
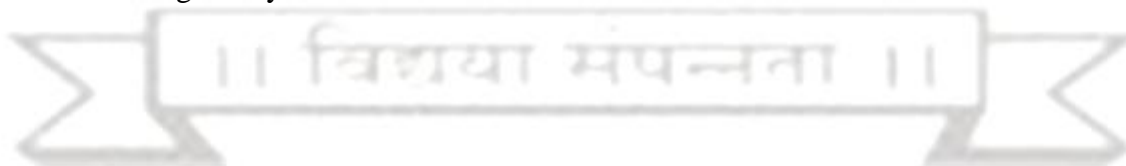
# Punyashlok Ahilyadevi Holkar Solapur University Solapur
## B.E. (INFORMATION TECHNOLOGY)
## SEMESTER - II
## IT 424B: ELECTIVE – II: PATTERN RECOGNITION

**Teaching Scheme**                                          **Examination Scheme**
Lecture: 3 Hours /week, 3 credits                              ESE– 70 Marks
Tutorial:  2 Hours /week, 2 credits                            ISE–  30 Marks
                                                               ICA–  25 Marks

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## COURSE OBJECTIVES:
1. To acquaint students with the principles of pattern recognition.
2. To study different decision functions.
3. To study pattern classification based on different functions.
4. To study trainable pattern classifier.
5. To study pattern preprocessing and feature selection.

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## COURSE OUTCOMES:
At the end of the course students will be able to
1. Identify and analyze patterns from the real world data.
2. Implement techniques for pattern classification.
3. Implement techniques for pre-processing feature selection and syntactic pattern recognition.

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## SECTION- I

**Unit 1. Introduction :**                                           (**5 Hrs**)
The Information-Handling Problem , Basic Concepts of Pattern Recognition, Fundamental
Problems in Pattern Recognition System Design, Design Concepts and Methodologies ,Examples
of Automatic Pattern Recognition Systems, A Simple Automatic Pattern Recognition , Model

**Unit 2. Decision Functions:**                                          (**5 Hrs**)
Introduction ,Linear Decision Functions Generalized Decision Functions ,Pattern Space and
Weight Space, Geometrical Properties, Implementation of Decision Functions, Functions of
several variables.

**Unit 3: Pattern Classification by Distance Functions:**                      (**6 Hrs**)
Introduction, Minimum-Distance Pattern Classification, Cluster Seeking, Unsupervised Pattern
Recognition.

**Unit 4: Pattern Classification by Likelihood Functions**:                     (**6 Hrs**)
Introduction, Pattern Classification as a Statistical Decision Problem, Bayes Classifier for
Normal Patterns, Error Probabilities, A Family of Important Probability Density Functions and
Estimation of Probability Density Functions.

# SECTION II

**Unit 5: Trainable Pattern Classifiers-The Deterministic Approach:**                    (**6 Hrs**)
Introduction, The Perceptron Approach, Derivation of Pattern Classification Algorithms, Multicategory Classification,, Learning and Generalization, The Potential Function
Approach

**Unit 6: Trainable Pattern Classifiers-The Statistical Approach:**                    (**6 Hrs**)
Introduction, Stochastic      Approximation      Methods,      Derivation of pattern classification algorithms, the method of potential functions.

**Unit 7: Pattern Preprocessing and Feature Selection:**                    (**6 Hrs**)
Introduction, Distance Measures ,Clustering Transformations and Feature Ordering Clustering in Feature Selection, Feature Selection Through Entropy Minimization Feature Selection Through Orthogonal Expansions Feature Selection Through functional Approximation, Divergence Concept, Feature Selection Through Divergence Maximization, Binary Feature Selection.

**Unit 8: Syntactic Pattern Recognition:**                    (**5 Hrs**)
Introduction, Concepts From Formal Language Theory, Formulation of the Syntactic Pattern Recognition Problem , Syntactic Pattern Description, Recognition Grammars, Statistical Considerations, Learning and Grammatical inference, Automata as Pattern Recognizers.

**Text Book:**
1.   Pattern Recognition Principles by Julius T. Tou, Rafael C. Gonzalez (Addison Wesley Publishing
      Company).

**Reference Books:**
1.  Pattern Recognition & Image Analysis by Earl Gose & Richard Johnson Baugh Steve Jost (PHI)
2.  Syntactic Pattern Recognition & Applications by K. S. FU (PHI)
**3.**  Pattern Recognition - Statistical Structural & Neural Approaches by Robert Schalkoff ( Wiley India Edition)

**Assignments:**
The assignments to be completed as Term Work consist of Programs to

1.  Recognize line patterns in a given set of points.
2.  Develop pattern recognition techniques to distinguish facial feature classes using a supervised learning paradigm.
3.  Explore difference between color spaces and color-based image segmentation. Experiments with edge detection.
4.  Explore different feature spaces - using Fourier shape descriptors, experimenting with wavelet transform, template matching.
5.  Use and interpretation of ROC curves, experiments with PCA and ICA.
6.  Estimate and sampling from densities, learning video background models, building a simple object tracker.
7.  Use LDA for image analysis. Experiments with Support Vector Machines.
8.  Perform Image segmentation with K-means, EM and hierarchical clustering algorithms.
9.  Demonstrate Image morphing.

**Punyashlok Ahilyadevi Holkar Solapur University Solapur**
**B.E. (INFORMATION TECHNOLOGY)**
**SEMESTER - II**
**IT424C   Elective-II: 2. CLOUD COMPUTING**

| **Teaching Scheme** | **Examination Scheme** |
|---|---|
| Lecture: 3 Hours /Week , 3 Credits | ESE – 70 Marks |
| Tutorials:  2 Hours /Week, 2 Credits | ISE –  30 Marks |
| | ICA – 25 Marks |

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**COURSE OBJECTIVES:**
1.   To study concepts, characteristics, delivery models and benefits of cloud computing.
2.  To provide in-depth knowledge of security and compliance challenges of cloud computing.
3.   To get acquainted with cloud technologies to provide solutions.

**COURSE OUTCOME:**

At the end of the course students will be able to
1.  Demonstrate the cloud computing architecture and various cloud service models.
2.  Identify the issues of cloud computing such as security, privacy, and interoperability.
3.  Choose the appropriate technologies, and approaches for the related issues.
4.  Provide the appropriate cloud computing solutions and recommendations according to the applications .

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**SECTION-I**

**Unit 1:** Introduction to Cloud Computing                                                          **(5 Hrs)**

Definition, cloud computing defined, The SPI framework for cloud computing, The traditional Software Model, The cloud service delivery model, cloud deployment models, key drivers to adopting the cloud, the impact of cloud computing on users, governance in the cloud, barriers to cloud computing adoption in the enterprise.

**Unit 2:** Infrastructure security                                                          **(5 Hrs)**

The network level,the host level, the application level, Data security & storage, aspects of data security,data security mitigation ,provider data and its security.

**Unit 3:** Identity and Access Management                                                          **(7 Hrs)**

IAM challenges, IAM definitions, IAM architecture and practice. getting ready for the cloud, IAM standards and protocols for cloud services, IAM practices in the cloud, Cloud Authorization Management, Cloud Service provider.

**Unit 4 : Security Management in the cloud**                                                          **(6 Hrs)**

Security management standards, Security management in the cloud, Availability Management, Saas Availability Management, Paas Availability Management, Iaas Availability Management, Access control, Security Vulnerability, Patch, and Configuration management.

**Unit 5:  Privacy                                                                                                   (6 Hrs)**
What is Privacy, What is the data life cycle, key privacy concerns in the cloud, responsible for protecting privacy, changes to privacy risk management, compliance in relation to cloud computing, legal and regulatory implications, international laws and regulations.

**Unit 6: Cloud certifications and audit                                                        (8 Hrs)**
certifications, iso 9000 family of certifications, iso 27000 and isms family of certifications, cmmi certifications, cloud audit framework, systrust,webtrust,sas70,cloud auditing requirement internal audit requirement, customer audit requirement, government audit requirements.

**Unit 7: Application Development for cloud                                            (8 Hrs)**
Developing on-premise versus cloud applications, modifying traditional applications for deployment in the cloud, stages during the development process of cloud applications, managing a cloud application, using agile software development for cloud applications, static code analysis for cloud applications, developing synchronous and asynchronous cloud applications.
**Textbook:**

1. Cloud Security and privacy An enterprise perspective on risks and compliances, by Tim mather, Subra Kumaraswamy, and Shahed Latif,       SPD O'EEILLY.
2. Cloud Computing: Black Book, by Kalish Jayaswal, J. Kallakurchi, Donald J. Houde, Dr.Deven Shah Kogent learning Solutions Inc. , Dreamtech press.

**Reference Books:**

1. Cloud Security by Ronald Krutz and Russell Dean Vines, Wiley-India
2.  Enterprise Cloud Computing by Gautam Shroff,Cambridge

## List of Assignments

1. Study of Cloud Computing & Architecture.
2. Virtualization in Cloud.  Technology: KVM, VMware.
3. Study and implementation of Infrastructure as a Service.(by using Open Stack) Technology: Quanta Plus /Aptana /Kompozer.
4. Study and installation of Storage as Service. Concept: Storage as Service (SaaS) Technology: own Cloud.
5. Implementation of identity management. Technology: OpenStack.
6. Write a program for web feed.  Technology: PHP, HTML
7. Securing Servers in Cloud. Technology: own Cloud.
8. Case study on Amazon EC2.
9. Case study on Microsoft azure.

# Punyashlok Ahilyadevi Holkar Solapur University Solapur
## B.E. (INFORMATION TECHNOLOGY)
### SEMESTER - II
### IT 424D: ELECTIVE – II: INTERNET OF THINGS

**Teaching Scheme**
Lectures: 3 Hours /week, 3 credits
Tutorial: 2 hrs/week, 2 credits

**Examination Scheme**
ESE – 70 Marks
ISE – 30 Marks
ICA– 25 Marks

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**PREREQUISITES:**
1. Fundamentals of Communication and computer network
2. Micro controller, Network Security and Web programming.

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**COURSE OBJECTIVES:**
1. To study the genesis and impact of IoT applications and architectures in real world.
2. To illustrate diverse methods of deploying smart objects and connect them to network.
3. To get acquainted with different Application protocols for IoT and compare them.
4. To study basic principles of IoT Security and various business models.
5. To become aware of Data Analytics and Security in IoT.

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**COURSE OUTCOMES:**
At the end of the course students will be able to
1. Interpret the characteristics and applications of IoT for deployment of the architectural model.
2. Compare smart objects and associated technologies for deployment in the network.
3. Analyze and choose the IoT protocol for efficient network communication.
4. Apply security concerns and challenges while implementing IoT solutions.
5. Provide the appropriate IoT solutions to the given problem

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## SECTION – I

**Unit 1: Introduction to IoT** (7 Hrs)
Definition, Applications and characteristics of IoT, Physical Design of IoT, Logical Design of IoT, IoT Enabling Technologies, IoT Levels.

**Unit 2: IoT Architecture and Communication Technologies** (8 Hrs)
IoT Architecture by Oracle, Sources of IoT, M2M Communication, IoT/M2M systems, layers and design standards, Communication Technologies.

**Unit 3: Elements of IoT** (8 Hrs)
Sensor Technology, Participatory Sensing – Industrial IoT and Automotive IoT, Actuator, Sensor Data Communication Protocols, RFID, WSN Technology.

**Unit 4: IoT Standards and Connectivity** (8 Hrs)

Constrained Application Protocols (CoAP), Representational State Transfer (REST), Zigbee / IEEE 802.15.4, Bluetooth and its low energy profile, IEEE 802.15 WPAN, 6LoWPAN.

**Unit 5: IoT Security and Business model** (8 Hrs)

Introduction to IoT Privacy, Security and Vulnerabilities, Use case and Misuse cases, IoT Security Tomography and Layered attacker model, Business model and business model innovation for IoT, Value Creation in the IoT, Business model scenarios for IoT.

**Unit 6: Case Studies** (6 Hrs)

Domain Specific IoTs: Home Automation, Smart Cities, Environments, Energy, Agriculture, Industry, Health and Lifestyle.

**Text Book :**
1.  Internet of Things: A Hands-on approach, Arshdeep Bahga, Vijay Madisetti, Universities Press (Unit 1 and 6).
2.  IoT Architecture and Design Principles, Raj Kamal, McGraw Hill Education (Unit 2, 3 & 5).
3.  Building the IoT with IPv6 and MIPv6, Daniel Minoli, Wiley Publication ( Unit 4).

**Reference Books:**
1.  The Internet of Things: Applications and Protocols, Wiley publications. Author(s): Oliver Hersent, David Boswarthick, Omar Elloumi .

**Term Work** :

The Term Work should consist of design and implementing a mini project based on the techniques and tools covered in above chapters.

# Punyashlok Ahilyadevi Holkar Solapur University Solapur
## B.E. (INFORMATION TECHNOLOGY)
### SEMESTER - II
### IT425- WEB TECHNOLOGY

**Teaching Scheme**

Lecture: 2 Hours /Week, 2 Credits
Practical:2 Hours/ week, 1 Credit

**Examination Scheme**

ISE – 50 Marks
POE – 50 Marks
ICA – 25 Marks

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## COURSE OBJECTIVES:
1. To study the architecture of WWW, HTTP, web clients, web servers and session management.
2. To get acquainted with formatting and validating web pages.
3. To acquire skills required to create light weight browser based web applications using client side scripting frameworks.
4. To get in-depth knowledge of dynamic website by using Web Technologies.

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## COURSE OUTCOMES:
At the end of the courses students will be able to
1. Design and develop web pages using HTML and CSS.
2. Analyze client/server side scripting technologies and select an appropriate one for given requirements of a web application.
3. Design and Develop web application using client/server side scripting technologies for a given problem.

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### SECTION – I

**Unit 1: UI Design:** (3 Hrs)

HTML5: What is HTML5 - Features of HTML5 – Semantic Tags – New Input Elements and tags - Media tags (audio and video tags) – Designing Graphics using Canvas API - Drag and Drop features – Geo-location API - Web storage (Session and local storage).
CSS3: What is CSS3 –Features of CSS3 – Implementation of border radius, box shadow, image border, custom web font, backgrounds - Advanced text effects(shadow) - 2D and 3D Transformations - Transitions to elements - Animations to text and elements

**Unit 2: Responsive Web Design (RWD):** (4 Hrs)

Responsive Design: What is RWD – Introduction to RWD Techniques – Fluid Layout, Fluid Images and Media queries- Introduction to RWD Framework
Twitter Bootstrap – Bootstrap Background and Features - Getting Started with Bootstrap-Demystifying Grids – Off-Canvas - Bootstrap Components - JS Plugins – Customization

**Unit 3: Introduction to JavaScript** (4 Hrs)

Introduction - Core features - Data types and Variables - Operators, Expressions and Statements - Functions & Scope - Objects - Array, Date and Math related Objects - Document Object Model - Event Handling –Browser Object Model - Windows and Documents - Form handling and validations.
Object-Oriented Techniques in JavaScript - Classes – Constructors and Prototyping (Sub classes and Super classes) – JSON –Introduction to AJAX.

**Unit 4: RESTful Web Services**                                                            **(4 Hrs)**

REST and the Rebirth of HTTP, RESTful Architectural Principles, The Object Model, Model the URIs, Defining the Data Format, Assigning HTTP Methods, JAX-RS.

## SECTION – II

**Unit 5: Introduction to Server-side JS Framework – Node.js**            **(3 Hrs)**

Introduction - What is Node JS – Architecture – Feature of Node JS - Installation and setup - Creating web servers with HTTP (Request & Response) – Event Handling - GET & POST implementation - Connect to NoSQL Database using Node JS – Implementation of CRUD operations.

**Unit 6: Introduction to Client-side JS Framework – Basics of Angular 4.0**       **(5 Hrs)**

Introduction to Angular 4.0 - Needs & Evolution – Features – Setup and Configuration – Components and Modules – Templates – Change Detection – Directives – Data Binding -  Pipes – Nested Components

**Unit 7: Introduction to Client-side JS Framework – Forms and Routing in Angular 4.0**   **(3 Hrs)**

Template Driven Forms - Model Driven Forms or Reactive Forms - Custom Validators - Dependency Injection - Services - RxJS Observables -  HTTP  - Routing.

**Unit 8: PHP and MySQL**                                                               **(4 Hrs)**

Introduction to PHP 5 and PHP 6, variables and constants, program flow, functions, arrays and files and directories, Forms and Databases, integration with MySQL applications on PHP.

**Internal Continuous Assessment:**
1. Objective of assignments should be to test students understanding and assess their ability to put into practice the concepts and terminologies learned.
2. Assignments must be of nature, which require students to identify the use case scenarios for using technologies mentioned in syllabus.

**Text Books /Reference Books:**

1. Harvey & Paul Deitel& Associates, Harvey Deitel and Abbey Deitel, "Internet and World Wide Web - How To Program", Fifth Edition, Pearson Education, 2011.
2. Achyut S Godbole and Atul Kahate, "Web Technologies", Second Edition, Tata McGraw Hill, 2012.
3. Thomas A Powell, Fritz Schneider, "JavaScript: The Complete Reference", Third Edition, Tata McGraw Hill, 2013.
4. David Flanagan, "JavaScript: The Definitive Guide, Sixth Edition", O'Reilly Media, 2011
5. Bear Bibeault and Yehuda Katz, "jQuery in Action", January 2008
6. Web link for Responsive Web Design - https://bradfrost.github.io/this-is-responsive/
7. Ebook link for JavaScript  -  https://github.com/jasonzhuang/tech_books/tree/master/js
8. Nathan Rozentals, "Mastering TypeScript", April 2015
9. Nate Murray, Felipe Coury, Ari Lerner and Carlos Taborda, "ng-book, The Complete Book on Angular 4" September 2016
10. AmolNayak, "MongoDB Cookbook Paperback" , November 2014
11. KrasimirTsonev, "Node.js by Example Paperback", May 2015
12. Web link for TypeScript:  https://www.typescriptlang.org/
13. Web link for Angular4.0: https://angular.io/
14. Web link for Node.js : https://nodejs.org/en/

# Punyashlok  Ahilyadevi  Holkar Solapur University Solapur
## B.E. (INFORMATION TECHNOLOGY)
## SEMESTER – II
## IT426- PROJECT-II

| Teaching Scheme | Examination Scheme |
|---|---|
| Practical: 6 Hours/ week, 3 Credits | ESE – 100 Marks |
| | ICA – 100 Marks |

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## COURSE OBJECTIVES:
1.  To study methods to analyze technological alternatives for developing IT solution with relevance to environment and sustainability.
2.  To explore state-of-art tools and FOSS alternatives to develop solutions meeting societal and professional needs.
3.  To enable development of a system through Software Development Life Cycle.
4.  To get acquainted to work in teams observing professional ethics.
5.  To enable effective written and oral communication for presentation.
6.  To enable self study and lifelong learning.

## COURSE OUTCOMES:
At the end of the course students will be able to
1.  Analyze technological alternatives for developing IT solution with relevance to environment and sustainability.
2.  Explore state-of-art tools and FOSS alternatives to develop solutions meeting societal and professional needs.
3.  Develop a system through Software Development Life Cycle.
4.  Demonstrate ability to engage in teamwork while observing professional ethics.
5.  Communicate project work in writing and oral presentation.
6.  Inculcate habit of self study to become a lifelong learner.

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## Strategy:

The group will continue to work on the implementation of project whose design is completed in the semester VII.

1.  Project work should be continually evaluated based on the contributions of the group members, originality of the work, innovations brought in, research and developmental efforts, depth and applicability, etc.
2.  The code will be developed and checked by the guide.
3.  The group will submit project report in the bound copy.
4.  The project report should contain –
    1.  Problem specifications.
    2.  System definition – requirement analysis.
    3.  System design – dataflow diagrams, database design
    4.  System implementation – algorithm, code documentation
    5.  Test results and test report.
    6.  Bibliography

Term work will be jointly assessed by a panel of teachers appointed by head of the department. Oral examination will be conducted by internal and external examiners as appointed by the University.