**AMRUTVAHINI COLLEGE OF ENGINEERING, SANGAMNER-422605**

**DEPARTMENT OF INFORMATION TECHNOLOGY**

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| **Class:** | TE-I.T. |  | **Program Name:** | I.T. |
| **Course Code:** | NBA Code: C15-302 |  | **Syllabus Pattern:** | 2015 |
| **Course Name:** | Database Management Systems(DBMS)& SL-I Lab |  | **Academic Year:** | 2017-2018 |
| **Faculty Name:** | Dr. B. L. Gunjal |  | **Semester:** | I |

**COURSE OUTCOMES (COs):**

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| **COs** | **Detail Statement** |
| C15-302-CO-1: | Analyze database models and entity relationship models. |
| C15-302-CO-2: | Execute queries on database using SQL DML/DDL commands. |
| C15-302-CO-3: | Develop PL/SQL programs including stored procedures, stored functions and cursors. |
| C15-302-CO-4: | Discuss recovery methods and database architectures |
| C15-302-CO-5: | Describe features of large scale databases and data management |
| C15-302-CO-6: | Analyze Data Warehousing, Data Mining and Big Data |
| C15-302-CO-7: | Develop database oriented applications using SQL, MYSQL, PL-SQL and Mongo DB following Teamwork and ethical standards. |

**As per AICTE, Competencies and Performance indicator**

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| **PO 1: Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization for the solution of complex engineering problems. | | |
| **Competency** | **Performance Indicator** | |
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| 1.1 Demonstrate competence in mathematical modeling | 1.1.1 Apply the knowledge of discrete structures, linear algebra, statistics and numerical techniques to solve problems | |
| 1.1.2 Apply advanced mathematical techniques to model and solve Information Technology engineering problems. | |
| 1.2 Demonstrate competence in basic sciences and engineering fundamentals | 1.2.1 Apply laws of natural science to an engineering problem. | |
| 1.2.2 Apply fundamental engineering concepts to solve engineering problems. | |
| 1.3 Demonstrate competence in specialized engineering knowledge to the program | 1.3.1 Apply theory and principles of Information Technology engineering to solve an engineeringproblem | |
| **PO 2: Problem analysis:** Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences. | | |
| 2.1 Demonstrate an ability to identify and formulate complex engineering problem | 2.1.1 Evaluate problem statements and identify objectives. | |
| 2.1.2 Identify processes/modules/algorithms of computer based system and parameters to solve a problem | |
| 2.1.3 Identify mathematical algorithmic knowledge that applies to a givenproblem | |
| 2.2 Demonstrate an ability to formulate a solution plan, methodology for an engineering problem, and interpret a model | 2.2.1 Reframe the computer based systeminto interconnectedsubsystems | |
| * + 1. Identify functionalities and computingresources | |
| 2.2.3 Identify existing solution/methods to solve the problem, including forming justifiedapproximations and assumptions | |
| 2.2.4 Compare and contrast alternative methods/solutionto select the bestmethods/Process | |
| 2.2.5 Able to apply Information Technology engineering principles to formulate modules of a system with required applicability and performance. | |
| 2.2.6 Identify design constraints for requiredperformance criteria. | |
| 2.3 Demonstrate an ability to execute a solution process and analyze results | 2.3.1 Apply engineering mathematics/ natural sciences/ engineering sciences to implement the solutions. | |
| 2.3.2 Analyze and interpret the results using appropriate tools. | |
| 2.3.3 Identify the limitations of the solutionand sources/causes. | |
| 2.3.4 Draw conclusions with respect to the objectives and limitations of the analysis. | |
| **PO 3: Design/Development of Solutions:** Design solutions for complex engineering problems and designsystemcomponentsorprocessesthatmeetthespecifiedneedswithappropriateconsideration for public health and safety, and cultural, societal, and environmentalconsiderations. | | |
| 3.1 Demonstrate an ability to define a complex/open-ended problem in engineering terms | 3.1.1 Able to define a precise problem statement with objectives and scope. | |
| 3.1.2 Able to identify and document system requirements from stake holders. | |
| 3.1.3 Ability to review state of the art literature to synthesize system requirements. | |
| 3.1.4 Ability to choose appropriate quality attributes as defined by ISO/IEEE standard. | |
| 3.1.5 Explore and synthesize system requirementsfrom larger social and professionalconcerns | |
| 3.1.6 Ability to develop software requirement specifications  (SRS). | |
| 3.2 Demonstrate an ability to generate a diverse set of alternative design solutions and select optimal design scheme for further development | 3.2.1 Ability to explore design alternatives. | |
| 3.2.2 Ability to produce a variety of potential design solutions suited to meet functionalrequirements | |
| 3.2.3 Identify suitable non-functional requirements for evaluation of alternate design solutions. | |
| 3.2.4 Ability to perform systematic evaluation of the degree to which several design concepts meet the criteria. | |
| 3.2.5 Consult with domain experts and stakeholdersto select candidate engineering design solution for furtherdevelopment | |
| 3.3 Demonstrate an ability to advance an engineering design to define end state | 3.3.1 Ability to refine architecture design into adetailed design within the existingconstraints. | |
| 3.3.2 Ability to implement and integrate themodules. | |
| 3.3.3 Ability to verify the functionalities and validatethe design. | |
| **PO4:Conductinvestigationsofcomplexproblems:**Useresearch-basedknowledgeandresearch methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide validconclusions. | | |
| 4.1 Demonstrate an ability to conduct investigations of technical issues consistent with their level of knowledge and understanding | 4.1.1 Define a problem for purposes of investigation, its scope and importance | |
| 4.1.2 Ability to choose appropriate procedure/algorithm, data set and test cases. | |
| 4.1.3 Ability to choose appropriate hardware/software tools to conduct the experiment. | |
| 4.2 Demonstrate an ability to design experiments to solve open ended problems | 4.2.1 Design and develop appropriate procedures/methodologies based on the study objectives | |
| 4.3 Demonstrate an ability to analyze data and reach a valid conclusion | 4.3.1 Use appropriate procedures, tools and techniques to collect and analyze data | |
| 4.3.2 Critically analyze data for trends and correlations, stating possible errors and limitations | |
| 4.3.3 Represent data (in tabular and/or graphical forms) so as to facilitate analysis and explanation of the data, and drawing of conclusions | |
| 4.3.4 Synthesize information and knowledge about the problem from the raw data to reach appropriate conclusions | |
| **PO 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. | | |
| 5.1 Demonstrate an ability to identify / create modern engineering tools, techniques and resources | | 5.1.1 Identify modern engineering tools, techniques and resources for engineering activities |
| 5.1.2 Create/adapt/modify/extend tools and techniques to solve engineering problems |
| 5.2 Demonstrate an ability to select and apply discipline specific tools, techniques and resources | | 5.2.1 Identify the strengths and limitations of tools for (i) acquiring information, (ii) modeling and simulating, (iii) monitoring system performance, and (iv) creating engineering designs. |
| 5.2.2 Demonstrate proficiency in using discipline specific tools |
| 5.3 Demonstrate an ability to evaluate the suitability and limitations of tools used to solve an engineering problem | | 5.3.1 Discuss limitations and validate tools, techniques and resources |
| 5.3.2 Verify the credibility of results from tool use with reference to the accuracy and limitations, and the assumptions inherent in their use. |
| **PO 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 | | |
| 6.1 Demonstrate an ability to describe engineering roles in a broader context e.g. pertaining to the environment, health, safety, legal and public welfare | | 6.1.1 Identify and describe various engineering roles for public interest at global, regional and local level |
| 6.2 Demonstrate an understanding of professional engineering regulations, legislation and standards | | 6.2.1 Interpret legislation, regulations, codes, and standards relevant to your discipline and explain its contribution to the protection of the public |
| 6.3 Demonstrate the ability to recognize the impacts of engineering within a global society (the broader public interest) | | 6.3.1 Recognize impact on societal, health, safety, legal, and cultural issues while performing engineering design and analysis in a global context |
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| **PO 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. | | |
| 7.1 Demonstrate an understanding of the impact of engineering and industrial practices on social, environmental and in economic contexts | | 7.1.1 Identify risks/impacts in the life-cycle of an engineering product or activity |
| 7.2.1 Understand the relationship between the technical, socio economic and environmental dimensions of sustainability |
| 7.2 Demonstrate an ability to apply principles of sustainable design and development | | 7.2.1 Describe management techniques for sustainable development |
| 7.3 Demonstrate an ability apply alternative ways to prevent or mitigate adverse social, human health, safety and environmental, impacts | | 7.3.1 Apply principle of preventive engineering and sustainable development to an engineering activity or product relevant to the student's discipline |
| **PO 8: Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice. | | |
| 8.1 Demonstrate an ability to recognize ethical dilemmas | | 8.1.1 Identify situations of unethical professional conduct and propose ethical alternatives. |
| 8.2 Demonstrate an ability to apply the Code of Ethics | | 8.2.1 Identify tenets of the professional code of ethics. |
| 8.2.2 Examine and apply moral & ethical principles to known case studies. |
| 8.3 Demonstrate the ability to act ethically and demonstrate individual accountability | | 8.3.1 Demonstrate the ability to behave in accordance with code of behavior on academic matters. |
| **PO9:Individualandteamwork:**Functioneffectivelyasanindividual,andasamemberorleaderindiverse teams, and in multidisciplinarysettings. | | |
| 9.1 Demonstrate an ability to form a team and define a role for each member | | 9.1.1 Recognize a variety of working and learning preferences; appreciate the value of diversity on a team. |
| 9.1.2 Implement the norms of practice (e.g. rules, roles, charters, agendas, etc.) of effective team work, to accomplish a goal. |
| 9.2 Demonstrate effective individual and team operations-communication, problem solving, conflict resolution and leadership skills | | 9.2.1 Demonstrate effective communication, problem solving, conflict resolution and leadership skills. |
| 9.2.2 Treat other team members respectfully. |
| 9.2.3 Listen to other members. Maintain composure in difficult situations. |
| 9.3 Demonstrate success in a team based project | | 9.3.1 Present results as a team, with smooth integration of contributions from all individual efforts. |
| **PO 10: Communication:** Communicate effectively on complex engineering activities with the engineering community and with the 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 | | |
| 10.1 Demonstrate an ability to comprehend technical literature and document project work | | 10.1.1 Read, understand and interpret technical and non-technical information. |
| 10.1.2 Produce clear, well-constructed, and well-supported written engineering documents. |
| 10.1.3 Create flow in a document or presentation - a logical progression of ideas so that the main point is clear. |
| 10.2 Demonstrate competence in listening, speaking, and presentation | | 10.2.1 Listen to and comprehend information, instructions, and viewpoints of others. |
| 10.2.2 Deliver effective oral presentations to technical and nontechnical audiences. |
| 10.3 Demonstrate the ability to integrate different modes of communication | | 10.3.1 Create engineering-standard figures, reports and drawings to complement writing and presentations. |
| 10.3.2 Use a variety of media effectively to convey a message in a document or a presentation. |
| **PO 11: Project management and finance:** Demonstrate knowledge and understanding of the engineering andmanagementprinciplesandapplythesetoone’sownwork,asamemberandleaderinateam,tomanage projects and in multidisciplinaryenvironments. | | |
| 11.1 Demonstrate an ability to evaluate the economic and financial performance of an engineering activity | | 11.1.1 Describe various economic and financial costs/benefits of an engineering activity. |
| 11.1.2 Analyze different forms of financial statements to evaluate the financial status of an engineering project. |
| 11.2 Demonstrate an ability to compare and contrast the costs/ benefits of alternate proposals for an engineering activity | | 11.2.1 Analyze and select the most appropriate proposal based on economic and financial considerations. |
| 11.3 Demonstrate an ability to plan/ manage an engineering activity within time and budget constraints | | 11.3.1 Identify the tasks required to complete an engineering activity, and the resources required to complete the tasks. |
| 11.3.2 Use project management tools to schedule an engineering project so it is completed on time and on budget. |
| **PO 12: Life-long learning:**Recognise the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. | | |
| 12.1 Demonstrate an ability to identify gaps in knowledge and a strategy to close these gaps | | 12.1.1 Describe the rationale for requirement for continuing professional development. |
| 12.1.2 Identify deficiencies or gaps in knowledge and demonstrate an ability to source information to close this gap. |
| 12.2 Demonstrate an ability to identify changing trends in engineering knowledge and practice | | 12.2.1 Identify historic points of technological advance in engineering that required practitioners to seek education in order to stay current. |
| 12.2.2 Recognize the need and be able to clearly explain why it is vitally important to keep current regarding new developments in your field. |
| 12.3 Demonstrate an ability to identify and access sources for new information | | 12.3.1 Source and comprehend technical literature and other credible sources of information. |
| 12.3.2 Analyze sourced technical and popular information for feasibility, viability, sustainability, etc. |
| **PSO-1:** Apply principles of science, mathematics along with programming paradigms and problem solving skills using appropriate tools, techniques to expedite solution in I.T. domain. | | |
| 1.1 Apply principles of science and mathematics to expedite solution in I.T. domain. | | 1.1.1 Apply concepts of basic science such as laws of physics, chemistry and mathematical techniques such as linear algebra (matrices, vectors), statistics, differentiation, integration to solve problems. |
| 1.2 Apply programming paradigms and problem solving skills to expedite solution in I.T. domain. | | 1.2.1 Use of programming languages such as C/C++, SQL, PL-SQL, HTML, ,PHP, Python, Java etc and problem solving skills to find the solution |
| 1.3 Apply appropriate tools and techniques to expedite solution in I.T. domain. | | 1.3.1 Create/adapt/modify/extend tools and techniques to solve engineering problems in I.T. domain |
| **PSO-2**: Demonstrate core competencies related to I.T. in domain of Data structures &algorithms, Software Engineering &Modeling, Hardware, Distributed Computing, Networking &security, Databases, Discrete mathematics &algebra, Machine Learning, Operating System. | | |
| 2.1 Demonstrate core competencies related to I.T.in domain of Data structures &algorithms, Software Engineering &Modeling, Hardware | | 2.1.1 Abilityto demonstrate concepts and fundamentals of one or more subjects ofI.T. in domain of Data structures &algorithms, Software Engineering &Modeling, Hardware. |
| 2.2 Demonstrate core competencies related to I.T.in domain of Distributed Computing, Networking &security, Databases | | 2.2.1 Abilityto demonstrate concepts and fundamentals of one or more subjects of I.T. in domain of Distributed Computing, Networking &security, Databases |
| 2.3 Demonstrate core competencies related to I.T.in domain of Discrete mathematics &algebra, Machine Learning, Operating System. | | 2.3.1 Abilityto demonstrate concepts and fundamentals of one or more subjects of I.T. in domain ofDiscrete mathematics &algebra, Machine Learning, Operating System. |
| **PSO-3:**Demonstrate leadership qualities and professional skills in modern I.T. platform for creating innovative carrier paths in placements, entrepreneurship and higher studies | | |
| 3.1 Demonstrate leadership qualities and professional skills for creating innovative carrier paths in placements | | 3.1.1 Able to create innovative carrier with placements in reputed domestic, national or multinational companies in I.T. domain. |
| 3.2 Demonstrate leadership qualities and professional skills for creating innovative carrier paths entrepreneurship | | 3.2.1 Initiate/ prepare/participate supporting activities for innovativecarrier path for startups/entrepreneurship including small scale/medium scale or large scale companies related to I.T. domain |
| 3.3 Demonstrate leadership qualities and professional skills for creating innovative carrier paths in higher studies | | 3.3.1 Initiate/ prepare/participate supporting activities for innovativecarrier path towards higher studies in MTech/MS/MBA etc after completion of graduation in I.T. |

**CO-PO MAPPING**

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| CO/PO | PO1  EK | PO2  PA | PO3  DD | PO4  CPI | PO5  MTU | PO6  E&S | PO7  ES | PO8  Eth | PO9  TW | PO10  Com. | PO11  PMF | PO12  LL |
| C15-302.1 | 1 | 2 | 2 | 2 | 3 | 1 | --- | --- | --- | --- | --- | 1 |
| C15-302.2 | 2 | 2 | 2 | 2 | 2 | 1 | --- | --- | --- | --- | --- | 2 |
| C15-302.3 | 3 | 3 | 2 | 3 | 2 | 2 | 2 | --- | --- | --- | --- | 2 |
| C15-302.4 | 2 | 2 | 3 | 2 | --- | 2 | 2 | --- | --- | --- | --- | 3 |
| C15-302.5 | 2 | 1 | 3 | 2 | --- | 1 | --- | --- | --- | --- | --- | 3 |
| C15-302.6 | 2 | 2 | 3 | 2 | --- | 1 | --- | --- | --- | --- | --- | 3 |
| C15-302.7 | 2 | 2 | 2 | 2 | 1 | 1 | --- | 3 | 3 | 3 | 2 | 2 |
| C15-302 | 2 | 2 | 2.42 | 2.14 | 2 | 1.28 | 2 | 3 | 3 | 3 | 2 | 2.29 |

**CO-PSO MAPPING**

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| CO/PSO | PSO1 | PSO2 | PSO3 |
| C15-302.1 | 1 | 2 | 2 |
| C15-302.2 | 2 | 2 | 3 |
| C15-302.3 | 2 | 2 | 3 |
| C15-302.4 | 1 | 2 | 2 |
| C15-302.5 | 2 | 2 | 3 |
| C15-302.6 | 1 | 2 | 3 |
| C15-302.7 | 3 | 2 | 3 |
| C15-302 | 1.71 | 2 | 2.71 |

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| |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | CO/PO | PO1  EK | PO2  PA | PO3  DD | PO4  CPI | PO5  MTU | PO6  E&S | PO7  ES | PO8  Eth | PO9  TW | PO10  Com. | PO11  PMF | PO12  LL | PSO1 | PSO2 | PSO3 | | C15-302.1 | 1.2.2 | 2.1.1,  2.3.1 | 3.2.1,  3.3.3 | 4.1.1  4.2.1 | All | 6.1.1, | --- | --- | --- | 10.1.2,  10.3.1 | --- | 12.2.2 | 1.3.1 | 2.2.1  2.3.1 | 3.1.1,  3.3.1 | | C15-302.2 | 1.2.2,  1.3.1 | 2.1.1,  2.3.2,  2.3.3 | 3.1.1,  3.2.1,  3.2.2 | 4.1.1,  4.1.2,  4.3.3 | 5.1.1,  5.1.2, | 6.1.1, | --- | --- | --- | --- | --- | 12.1.1,  12.2.1 | 1.2.1  1.3.1 | 2.2.1  2.3.1 | 3.1.1,  3.2.1,  3.3.1 | | C15-302.3 | 1.1.1.,  1.2.2,  1.3.1 | 2.1.1,  2.1.2,  2.2.3,  2.3.1,  2.3.2 | 3.2.1,  3.2.2,  3.3.2,  3.3.3 | 4.1.1.,  4.1.2,  4.2.1,  4.3.3. | 5.1.1,  5.1.2 | 6.1.1 | --- | --- | --- | --- | --- | 12.1.1,  12.2.1 | 1.2.1  1.3.1 | 2.2.1  2.3.1 | 3.1.1,  3.2.1,  3.3.1 | | C15-302.4 | 1.2.1,  1.3.1 | 2.1.3,  2.2.2, | 3.1.1,  3.2.2,  3.3.4,  3.3.1 | 4.2.1,  4.3.3 | --- | 6.1.1 | --- | --- | --- | --- | --- | 12.1.1,  12.2.2,  12.3.3 | 1.3.1 | 2.3.1 | 3.1.1,  3.3.1 | | C15-302.5 | 1.2.1,  1.3.1 | 2.3.1 | 3.1.1,  3.2.2,  3.3.4,  3.3.1 | 4.2.1,  4.3.3 | --- | 6.1.1 | --- | --- | --- | --- | --- | 12.1.1,  12.2.2,  12.3.3 | 1.2.1  1.3.1. | 2.2.1  2.3.1 | 3.1.1,  3.2.1,  3.3.1 | | C15-302.6 | 1.2.1,  1.3.1 | 2.1.3,  2.2.2, | 3.1.1,  3.2.2,  3.3.4,  3.3.1 | 4.2.1,  4.3.3 | --- | 6.1.1 | --- | --- | --- | --- | --- | 12.1.1,  12.2.2,  12.3.3 | 1.3.1. | 2.2.1  2.3.1 | 3.1.1,  3.2.1,  3.3.1 | | C15-302.7 | 1.2.1,  1.3.1 | 2.1.3,  2.2.2, | 3.1.1,  3.2.1 | 4.2.1,  4.3.3 | 5.1.2 | 6.1.1 | --- | 8.2.1,  8.2.1,8.3.1, | 9.1.1,  9.2.1,9.2.2,  9.3.1. | 10.1.1,  10.1.2,  10.2.1,  10.3.1 | --- | 12.1.1,  12.2.2,  12.3.3 | 1.2.1,  1.3.1. | 2.2.1,  2.3.1 | 3.1.1,  3.2.1,  3.3.1 |   **Justification Matrix.** |