Course Design Review
Action Taken Report of the University on the Feedback of Stakeholders

Computer Science & Engineering (UG)

Action Plan – Academic Review of Computer Science & Engineering (UG)

Action Taken Report Approved in Board of Studies dated March 2016 and implemented with effect from July 2017

2016-17

1	Observations/ Recommendations based on feedback	POs impacted
	Feedback from Employee 1. Students need to understand practical application of concepts and more hands on required. 2. Enhancement and depth of programming skills. 3. Knowledge of problem solving approaches and alternate solutions. 4. The project quality and depth to be improved. 5. Skill improvement to inculcate implementing change in the requirements during project implementation. 6. Students need to work on open source project and contribute to GitHub. **Course Feedback:** 1. The course contents needs to be relevant with current knowledge and practices in the industry like DCC. 2. Theoretical courses like DMS, OS need to be connected with real time examples. **Feedback from Faculty --- Pre BoS MOM** 1. Hands on experience needed to understand architecture concepts and software design cycles in projects. 2. Students need to enhance problem solving abilities and hence tutorials need to be introduced. 3. PL/SQL and DB security concepts need to be introduced in DBMS course **Feedback from Alumni:** 1. Exposure to recent technologies of industry like AI and ML. 2. Work on real time problems for projects. 3. Exposure to use of fundamentals of mathematics to computer science applications.	**PO-1** **PO-2** **PO-3** **PO-5**

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Actions taken: Based on the feedback from stakeholders, employers, faculty, alumni and students the following actions are initiated.	**Course Revised/ Added**	**BoS approved Date**
1. The contents of Applied Statistics (15EMAB209) are redesigned with supporting lab tutorials. 2. Tutorial is introduced for DAA (15ECSC207) course with emphasis on analysis of the algorithms. 3. In DBMS (15ECSC208) , Course Projects are introduced to apply ER model and normalization principles on real life problems. 4. CN lab(15ECSP302) is redesigned with focus towards structured enquiry and open ended problem statements for analysis of algorithms and protocols. 5. An elective course Algorithmic problem solving (17ECSE309) is introduced to enhance Problem solving and programming skills. 6. CO Lab course (15ECSC206) is introduced with experiments and to comprehend design principles of components of computer systems. 7. Theme based mini and minor project in the domain of data Analytics, System engineering and networking domain are introduced. 8. Blue print methodology which involves brain storming, iterative hand drawn designs, design evaluations and implementation is introduced. 9. Mini project is focused on software design life cycle (SDLC) is introduced.	**Courses Revised:** 1. Data structures and algorithms (15ECSC207) 2. Applied Statistics(15EMAB209) 3. DBMS (15ECSC208) 4. CN (15ECSP302) 5. OS (15ECSC304) 6. CO (15ECSC206) 7. APS (17ECSE309) 8. Mini Project (15ECSW301) **Courses Introduced:** 1. ML (17ECSC306) 2. DCC (17ECSC305)	**18-03-2016**

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2017-18

2	Observations/ Recommendations based on feedback	POs impacted
	Feedback from Employee 1. Focus on Fundamental knowledge in course of OS, Programming. 2. Object oriented design concepts should be included. 3. Not able to map concepts to real time examples. 4. To think out of box approach for problem solving. 5. Exposure to new technologies. 6. Practical application of concepts/more hands on required. 7. Practical application of data structure is compulsory. **Feedback from Faculty --- Pre BoS MOM** 1. Multithread programming concepts to be included in OOP's syllabus. 2. Machine independent code optimization should be included in POCD. 3. Focus towards finite automata theory and group theory. **Course Feedback:** 1. The course contents needs to be relevant with current knowledge and practices in the industry 2. More exposure towards current programming skills viz. python as scripting language and , tensorflow as frameworks. **Feedback from Alumni:** 1. Exposure to recent to recent technologies like AI/ML, IoT, Quantum Computing. 2. Students programming code needs to be evaluated on hacker rank and code chef platforms.	**PO-1** **PO-3** **PO-5** **PO-8** **PO-10**

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Actions taken: Based on the feedback from stakeholders, employers, faculty, alumni and students the following actions are initiated.	**Course Revised/ Added**	**BoS approved Date**
1. In 'Data structures with C' and 'Object Oriented Programming with C++' courses software testing practices are adopted in lab assignments. 2. In 'Computer programming using C', programs along with test plans are written. Debugging, code optimization, refactoring and review are performed. Quizzes are conducted using Moodle platform. 3. In project work, for industry track posters are displayed to students, followed by allocation of teams to industry projects. Meetings are conducted with industry mentors to design and develop the solutions by considering the societal needs. In entrepreneur track the selection process is done by CtiE to develop society relevant solutions. 4. Hadoop framework and R / Python programming were used for implementing Data mining functionalities in the course on Data Mining and Business Analytics. 5. 20% of the minor and capstone projects are carried out in collaboration with industry for students to get exposure to the industrial practices. 6. In project work, design and documentation of the Agile software development of the software/product developed is performed. 7. Co-teaching of courses Operating Systems (15ECSC304), Machine learning (17ECSC306) by industry experts to provide practical industrial perspective to the theoretical concepts. 8. Microcontroller Programming & Interfacing to enable students to conduct projects on real time application such as IoT and embedded applications. 9. Case study on ethics were given in information security course(15ECSC402)	**Courses Revised:** 1. Scripting Languages Lab - 18ECSP201- (0-0-2) 2. Computer Organization and Architecture - 18ECSC201- (4-0-0) 3. Object Oriented Programming with C++ - 18ECSC207-(3-0-0) 4. Operating System Principles and Programming - 18ECSC202 (4-0-1) 5. Microcontroller Programming & Interfacing (18ECSC206) - (3-0-1) 6. Object Oriented Programming with C++ lab- 18ECSP203 - (0-0-1.5) **Courses Introduced:** 1. Engineering Design (17ECSP202) 2. Product Realization(17ECSP203) 3. IoT(17ECSE3030)	**01-04-2017**

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3	Observations/ Recommendations based on feedback	POs impacted
	Feedback from Employee 1. The students should have fundamental knowledge in core course, OS, Object Oriented Programming. 2. The Project quality and depth of problem statements needs to be enhanced. 3. The students area able to answer theoretically on the technical topics however; they could not apply the same to a practical situation. 4. Most of them lack basic knowledge and analytical skills. 5. The courses related to data managements need to introduce awareness of industry standards and tool usages. 6. The business requirement analysis phase of the project needs to be introduced. 7. The students need to have knowledge and details of the library used in the project. **Feedback from Faculty --- Pre BoS MOM** 1. A new course BDA is introduced with associated lab on implementation of Big data analysis using MongoDB and hive. 2. A group of new program electives (PE) such as SNA, Cyber Security, SDN and NLP were introduced. 3. Capstone project/Industry project and Electives/Industry Internship of 14 credits & 6 credits respectively was discussed. 4. The project execution, expectations, delivery approaches, evolution & exam patterns should be incorporated. 5. In the space of the pedagogical approach of project in relationship with SE course, Industry demands and Alumni inputs is taken. This will be continuous process of improvement for better productivity and projects being discussed. **Course Feedback:** 1. Students have asked to conduct training from industry experts on cyber security and information security. 2. More exposure towards current programming skills. **Feedback from Alumni:** 1. Software engineering course need to include topics on DevOps and Jenkins. 2. Inclusions of version controlling in GitHub can be adopted. 3. Industry problem statements should be implemented in mini, minor and capstone projects.	**PO-1** **PO-2** **PO-3** **PO-5** **PO-10** **PO-12**

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Actions taken: Based on the feedback from stakeholders, employers, faculty, alumni and students the following actions are initiated.	Course Revised/ Added	BoS approved Date
1. A course on institutional research project (IRP) is introduced to provide students an exposure for solving real time projects involving current technologies using KLETech eco systems as a live lab. 2. A course REU is introduced to enable students to take part in the research activities in their future career during and beyond their academia. It also helps them to experience and learn to identify, solve and evaluate engineering solution for current real time problems. 3. To apply knowledge of AI and deep learning algorithms on embedded systems using android technology to enrich students understanding to port model on embedded platform. 4. SDP aims to design and develop a solution using software design principles:- design patterns (creational, behavioral & structural) , User experience (UX) design and API (application programming interface) that are generally followed in industries. 5. Industry internship training is introduced to enable students for the industry ecosystem while working on live projects. 6. Industry internship projects are introduced to enable students to work on industry standards and deadline based project delivery. 7. Electives like model thinking, NLP and SADT were introduced to map projects that target towards job profile. 8. Tutorials included in DMS to enhance learning of fundamentals. 9. In machine learning course, tutorial problems are taken from Kaggle and Stanford university websites. 10. The course on Problem solving with data structures is introduced at first year involving faculty from different disciplines. 11. The training sessions are carried out in Information security course for incremental adding of security to the software namely password at first level, including captcha, one-time password (OTP), encryption and decryption during data communication. 12. Workshop is conducted on MEAN STACK in Web Technology lab, to provide a hands-on explore to the current technologies in the field. 13. Blueprint methodology - Brainstorming, Iterative hand drawn designs, Design evaluation and implementation are carried out in Mini project course. 14. In Principles of Compiler Design difficulty is observed in designing of context free grammars (CFG) for a given language and self-exploration of tools for building the phases of compiler, to overcome	**Courses Revised:** 1. Discrete Mathematical Structures-19ECSC202-(3-1-0) 2. Principles of Compiler Design - 19ECSC203 -(3-1-0) **Course Introduced:** 1. Natural Language Processing - 18ECSE403 - (3-0-0) 2. Wireless Adhoc& Sensor Networks -18ECSE406 - (3-0-0) 3. Advanced Parallel Computing - 18ECSE408 - (3-0-0) 4. Software Architecture and Design Thinking -18ECSE410 - (3-0-0) 5. Model Thinking - 18ECSE411 - (3-0-0) Computer Networks-1-19ECSC302 -(3-1-0) 6. Java Programming -19ECSP301 - (1-0-1.5) - New Course 7. Computer Networks-2-19ECSC303-(2-0-1.5) 8. Semantic Web – 19ECSE303 – (3-0-0) 9. Block Chain Technology – 19ECSE301-(2-0-1) 10. The ARM Architecture – 19ECSE302-(2-1-0) 11. Senior Design project (20ECSW401) – (0-0-6) 12. Embedded Intelligent System(18ECSE302) 13. REU (17ECSE490) 14. IRP(17ECSE491) 15. Business data analytics (17ECSC401)	**10-04-2018**

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this demonstration on the tools is performed. 15. The Algorithmic Problem Solving course is introduced in collaboration with Samsung. It is an elective open to all departments (intake through entrance test). The course is run on HackerRank/CodeChef platforms, which enables the students in building competitive programming skills. 16. Presentation of the course project as well as report writing is carried out in DBA Lab course.		

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Action Taken Report Approved in Board of Studies dated March 2019 and implemented with effect from July 2020

2019-20

4	Observations/ Recommendations based on feedback	POs impacted
	Feedback from Employee 1. The students need to focus on Weka, orange, Tableau tools usage in the data preprocessing in DMA and ML. 2. The students need to be exposed to Industry related project problem statements. 3. The students are able to answer theoretically on the technical topics however; they could not apply the same to a practical situation. 4. Improve the fundamentals in core courses and enhance the fundamental skills and analytical skills. 5. The students need to exposed technical skills and awareness of industry trends in the field of data management. **Feedback from Faculty --- Pre BoS MOM** 1. To enhance the automation technology tools skills in the domain of robotic process. 2. To introduce course on Block chain Technology to cater to industry requirements. **Course Feedback:** 1. Students requested to conduct training from industry experts on cyber security and information security. 2. The students requested to have workshops and hackathons to improve programming skills. **Feedback from Alumni:** 1. To inculcate innovation, IPR, entrepreneurship skills to be brought into practice by organizing or attending workshops. Inclusions of version controlling in GitHub can be adopted. 2. To identify set of companies to focus on industry-student profile match 3. Industry institute collaborations needs to be increased in the focused area of networks and data analytics.	**PO-1** **PO-2** **PO-3** **PO-4** **PO-10** **PO-11**

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Actions taken: Based on the feedback from stakeholders, employers, faculty, alumni and students the following actions are initiated.	Course Revised/ Added	BoS approved Date
1. Introduction of senior design project (20ECSW401) to focus on leveraging libraries, creating architecture, detailed design and qualitative evaluation. 2. Inclusion of storage from cloud, SaaS and skills for distributed storage in DCC course. 3. Introduction of engineering perspective examples in applied statistics using R. 4. IRP/SRP/REU projects in specialized domains introduced to enhance research skills in focused domain of networking, data analytics and AI/ML .	**Course Revised:** 1. DCC (17ECSC305) 2. Cyber Security (19ECSE401) 3. Senior Design project (20ECSW401) **Courses Introduced:** 1. Robotic process automation (20ECSE301) 2. SRP(19ECSE493) 3. Fuzzy Set Theory -19ECSE402 - (3-0-0)	15-04-2019

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KLE Technological University
Creating Value
Leveraging Knowledge

Earlier known as
B. V. B. College of Engineering & Technology

MTech Computer Science and Engineering

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Action Plan – Academic Review of Computer Science & Engineering

2016-17

1	Observations/ Recommendations based on feedback	POs impacted
	Feedback from Employee 1. List of Laboratories to be revised and importance is to be given to the latest technologies also hands on experience should be given lot of importance. 2. Project work and minor projects should be chosen based on the latest technology and the students should be made to work on research oriented projects. 3. Depth of the knowledge gained by PG Students should be more compared to UG Students. 4. The students should be made to publish papers in International Journals and conferences. 5. Fundamentals to be strengthened. **Feedback from Alumni:** 1. The students should be Exposure to the latest technologies. 2. The students should be sent to industry to do Project Work. 3. If the students are doing fourth semester project at the university, they must choose a research oriented projects. 4. Work on real time research oriented projects. **Feedback from Faculty --- Pre BoS MOM** 1. List of electives to be revised. 2. Project work and minor projects should be chosen based on the latest technology and the students should be made to work on research oriented projects.	**PO-1** **PO-2** **PO-3** **PO-4** **PO-5**

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3. The students should be made to publish papers in an International Journals and conferences.
4. Compiler Design, Cryptography and network security, Image and video processing and wireless networks courses to be given importance and to be either core or electives.

Course Feedback:

1. The courses like Compiler Design, Cryptography and network security, Image and video processing and wireless networks to be includes in the curriculum.
2. Data Mining along with Analytics to be to be added as an elective / core course as the industry trend is moving towards Business Analytics.
3. As the Software Testing is getting more importance in the industry, a course on Software Testing to be included.
4. Internet of Things, Parallel Processing, Distributed and Cloud Computing to be given priority.
5. Computer Graphics to be included in the list of electives.

Actions taken	**Course Revised/ Added**	**BoS approved Date**
1. Compiler Design and Cryptography and Network Security are added as electives in the first semester. 2. Distributed and Cloud Computing, Computer Networks and Software Testing are added core courses in the second Semester.	Compiler Design **16ECSE705** and Cryptography and Network Security **16ECSE707** are added as electives.	**18-03-2016**

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3. Computer Graphics, Applied Parallel Computing and Internet of Things Courses are added as Electives in the second Semester. 4. Software Testing Lab and Distributed and Cloud Computing Lab are introduced. 5. Data Mining and Business Analytics is added as a core course in the Third Semester.	Software Testing Lab **16ECSP717** Distributed and Cloud Computing Lab 16ECSP718 are introduced. Data Mining and Business Analytics 16ECSC801	

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2017-18

1	Observations/ Recommendations based on feedback	POs impacted
	Feedback from Employee 1. List of Laboratories to be revised and importance is to be given to the latest technologies also hands on experience should be given lot of importance. 2. **Computer Vision, AI and Machine Learning and Big Data Analytics** to be given Importance. 3. Project work and minor projects should be chosen based on the latest technology and the students should be made to work on research oriented projects. 4. **IoT with Machine Learning and Cloud Computing Projects** to be given to the Students. 5. Depth of the knowledge gained by PG Students should be more compared to UG Students. 6. The students should be made to publish papers in International Journals and conferences. 7. Fundamentals to be strengthened. **Feedback from Alumni:** 1. The students should be exposed to the latest technologies. **Computer Vision, AI and Machine Learning and Big Data Analytics.** 2. The students should be sent to industry to do Project Work. 3. If the students are doing fourth semester project at the university, they must choose a research oriented projects. 4. Work on real time research oriented projects.	**PO-1** **PO-2** **PO-3** **PO-4** **PO-5**

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Feedback from Faculty --- Pre BoS MOM

1. List of electives to be revised and **Artificial Intelligence and Machine Learning** course to be given importance.
2. **Web Technology Lab** to be introduced.
3. Fundamentals to be made strong especially **Mathematics / Analysis** to be given importance.
4. **Multimedia and Image Processing, Computer Vision, Big Data Analytics and Mobile Application Development** Courses to be given importance.
5. Project work and minor projects should be chosen based on the latest technology and the students should be made to work on research oriented projects. Deep Learning / Machine Learning Projects to be given importance.
6. The students should be made to publish papers in an International Journals and conferences.

Course Feedback:

1. The courses like Image and video processing and **Artificial Intelligence and Machine Learning** to be includes in the curriculum.
2. **Big Data Analytics** to be to be added as an elective / core course as the industry trend is moving towards Business Analytics.
3. As the **Mobile Application Development** is getting more importance in the industry, a course on Mobile Application Development to be included.
4. **Internet of Things, Parallel Processing, Distributed and Cloud Computing** to be given priority.

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Actions taken	**Course Revised/ Added**	**BoS approved Date**
1. **Artificial Intelligence and Machine Learning** an elective in the first semester 2. **Web Technology Lab** is introduced in the first semester 3. To improve the Maths fundamentals a **Maths** Course is introduced in the Second Semester. 4. **Multimedia and Image Processing** Course is introduced as an elective in Second Semester. 5. **Big Data Analytics** is introduced as a core subject in the Third Semester 6. **Mobile Application Development, Computer Graphics and Vision** are introduced as elective courses in the Third Semester.	Artificial Intelligence and Machine Learning **17ECSE705** Web Technology Lab 17ECSP709 Mathematics 17ECSC717 Multimedia and Image Processing 17ECSE714 Big Data Analytics 17ECSC801 Mobile Application Development 17ECSE803 Computer Graphics and Vision **17ECSE802**	**01-04-2017**

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Action Plan – Academic Review of Computer Science & Engineering

2018-19

1	Observations/ Recommendations based on feedback	POs impacted
Feedback from Employee 1. Suggested **through revision** of the courses to be taught. 2. Laboratories to be revised and importance is to be given to the **latest technologies** also **hands on** experience should be given lot of importance. 3. At least 6 hours per week to be given to **the data structure** Laboratory. 4. **Internet of Things** to be made as a core course. 5. **Python programming** to be taught as a laboratory course as python is getting more and more importance. 6. **Design and Analysis of Algorithms** to be given Importance with hands on experience. 7. One core course on **Distributed** and **Cloud Computing** is suggested. 8. **Software Engineering** was suggested to include. 9. **IoT with Machine Learning and Cloud Computing Projects** to be given to the Students. 10. Fundamentals to be strengthened and importance to be given to **Applied Mathematics** rather than only teaching Mathematics.		**PO-1** **PO-2** **PO-3** **PO-4** **PO-5**

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Feedback from Alumni:

1. The students should be exposed to the latest technologies. **Computer Vision, AI and Machine Learning and Big Data Analytics and Internet of Things.**
2. The students should be sent to **industry** to do Project Work.
3. If the students are doing fourth semester project at the university, they must choose **a research oriented projects.**
4. The students should be made to work on **real time research oriented projects** on Computer Vision, Artificial Intelligence and Computer Network.
5. The students should be trained on **Applied Mathematics** and the fundamentals to be made stronger.

Feedback from Faculty --- Pre BoS MOM

1. Fundamentals to be made strong especially **Applied Mathematics / Analysis** to be given importance.
2. Project work and minor projects should be chosen based on the latest technology and the students should be made to work on research oriented projects. **Deep Learning / Machine Learning Projects to be given importance.**
3. The students should be made to publish papers in an International Journals and conferences.
4. **Hands on** experience should be given a lot of importance.
5. The members suggested to have **one to two hours** of practical for each course.
6. Number of publications to be increased by doing research oriented projects.

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Course Feedback:

1. A course on Applied Mathematics to be included instead of only Mathematics.
2. Internet of Things to be made as a core and to be taught in the First Semester so that the students will be enable to publish papers.
3. **Artificial Intelligence and Machine Learning** to be includes in the curriculum however hands on **Python Programming** to be taught in the First Semester only.
4. Hands on Data Structure to be given to strengthen the programming skills.
5. As the **Mobile Application Development** is getting more importance in the industry, a course on Mobile Application Development to be included.
6. **Artificial Intelligence, Internet of Things, Parallel Processing, Distributed and Cloud Computing** to be given priority.
7. Strongly recommended to go for increased weight of **Practical** (L-T-P) for every course.

Actions taken	Course Revised/ Added	BoS approved Date
1. **Applied Mathematics** is made as a core course. 2. Almost every course is given one to two credits of weightage on hands on experience. 3. Internet of Things is made as a core course in the first semester. 4. Data Structure Lab and Python Programming Lab are introduced.	**Applied Mathematics** **Internet of Things** **Computer Networks** **Data Structure Lab** **Python Programming Lab** **Design and analysis of algorithms** **Distributed and Cloud Computing**	**07-04-2018**

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5. Design and Analysis of Algorithms is made four credit course with L-T-P as 2-0-2 so that the students will have strong hands on experience. 6. Software Engineering, Machine Learning, Distributed and Cloud Computing and Image Processing are included in the second semester. Each course is given the practical weightage. 7. Almost 80% of the total number of courses are redesigned to meet the suggestions given by the students, faculty, industry and the members of the BoS.	**Machine Learning** **Software Engineering** **Image and Video Processing** **Cryptography and Network Security** **Embedded Systems** **CG and Vision**	

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Action Plan – Academic Review of Computer Science & Engineering

2019-20

1	Observations/ Recommendations based on feedback	POs impacted
	Feedback from Employee 1. Since **Major Revisions** of the courses were made previous year, no revisions are suggested to the courses taught. 2. **Industrial Training / Mini Project** and **Project Work Phase One** is included in Third Semester and **Project Work Phase two** is included in Fourth Semester. **Feedback from Alumni:** 1. Since **Major Revisions** of the courses were made previous year, no revisions are suggested to the courses taught. 2. **Industrial Training / Mini Project** and **Project Work Phase One** is included in Third Semester and **Project Work Phase two** is included in Fourth Semester.	**PO-1** **PO-2** **PO-3** **PO-4** **PO-5**

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Feedback from Faculty --- Pre BoS MOM

1. Since **Major Revisions** of the courses were made previous year, no revisions are suggested to the courses taught.
2. **Industrial Training / Mini Project** and **Project Work Phase One** is included in Third Semester and **Project Work Phase two** is included in Fourth Semester.

Course Feedback:

1. Since **Major Revisions** of the courses were made previous year, no revisions are suggested to the courses taught.
2. **Industrial Training / Mini Project** and **Project Work Phase One** is included in Third Semester and **Project Work Phase two** is included in Fourth Semester.

Actions taken	Course Revised/ Added	BoS approved Date
1. Since **Major Revisions** of the courses were made previous year, no revisions are made to the courses taught.	**Parallel Computing** **Industrial Training / Mini Project**	**15-04-2019**

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2. **Industrial Training / Mini Project** and **Project Work Phase One** is included in Third Semester and **Project Work Phase two** is included in Fourth Semester.	**Project Work Phase**	

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Department of Automation and Robotics

Course Design Review

Action Taken Report of the University on the Feedback of Stakeholders

Programme Outcomes (PO's)

The graduates will have,

PO 1: Engineering knowledge	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization for the solution of complex engineering problems.
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.
PO 3: Design/Development of Solutions	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 public health and safety, and cultural, societal, and environmental considerations.
PO 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.
PO 5: Modern tool usage	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
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.
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.
PO 8: Ethics	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9: Individual and team work	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10: Communication	Communicate effectively on complex engineering activities with the engineering community and with t h e 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.
PO 11: Project management and finance	Demonstrate knowledge and understanding of t h e 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.
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.
PSO 13: Foundations of robotics	Identify the needs, analyze, design and develop simple robotic systems and programs for diverse applications.
PSO 14: Integration and applications of automation and robotics	Identify the needs, design, select and integrate appropriate automation and robotic subsystems for diverse applications.

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1. **Action Taken Report Approved in Board of Studies dated** 01-04-2017 **and implemented with effect from** June 2017

Observations/ Recommendations based on feedback	**POs impacted**
Employer Feedback: • Programming Skills especially of Non-IT Students needs improvement. • Emphasis on Problem Solving & alternate solutions required. **Teachers Feedback (Pre-BoS MoM):** Microcontrollers 16EARC207 • Students need to learn about Flash and EEPROM memory. • Exposure on industrial applications of Microcontrollers is required. Product Realization 16EARP208 • A course on Engineering Design was introduced at IV semester, which stopped at development of conceptual designs. It was found that students needed to be proficient in prototype development to make them undergo the entire cycle of product realization. Manufacturing & Metrology lab • Experiments related to measurement need to be added.	PO1,PO2, PO3,PO5, PO9, PO10,PO11,PO 12

Actions taken	**Course Revised (R)/ Added (A)**	**BoS approved Date**
1. Concepts related to data storage using flash and EEPROM memories and industrial applications of microcontrollers were introduced - 10 hours. 2. A course on Engineering Design was introduced at IV semester, with the emphasis on prototype development and entire cycle of product realization process. 3. Manufacturing & Metrology lab is introduced to include demonstrations, experiments, structured enquiry and open-ended experiments.	Microcontrollers 16ARC207 (R) Product Realization 16EARP208 (R) Manufacturing & Metrology lab 16EARP205(R)	01-04-2017

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2. **Action Taken Report Approved in Board of Studies dated 31-3-2018 and implemented with effect from June-2018.**

Observations/ Recommendations based on feedback	POs impacted
Employers Feedback: • Programming Skills especially of Non-IT Students needs improvement. • Logical Thinking needs improvement & more practice. • Practical Applications of Concepts / more hands on required as students are more theoretical. **Teachers Feedback (Pre-BoS MoM):** OOP and Python Practice - 16EARP305 • More focus needs to be given for solving real world problems. DBMS Practice 16EARP306 • Required proficiency in designing of database to address the requirements of the course offered from V semester onwards. Power Electronics, Motors & Drives 16EARE301 • Identified scope of addition of robotics and industrial drives concepts. • Reorganize flow of topics. Hydraulics and Pneumatics Lab 16EARP302 • Scope for Simulation and analysis of fluid power circuit using MATLAB has been identified. Algorithm Analysis & Program Design 17EARC203 • Required proficiency in programming to address the requirements of course offered from III semester onwards. Microcontrollers 17EARC207 • Students need to learn the latest technology subject like Machine learning. • The subject can be much appreciated by robotics students if subject is taught with Robot operating system Control Systems 17EARC209 • Content related to basics of controllers was missing in control systems (code 16EARC209)	**PO1, PO2, PO5**

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• State space was introduced as a foundation for mechatronics system design (18EARC304), which was taught in 5th semester. Microcontrollers Lab 17EARP207 • Students need exposure to PCB design and fabrication. **Students Feedback:** Microcontrollers Lab 17EARP207 • Needs hands on experience of PCB fabrication.	

Actions taken	**Course Revised(R) / Added (A)**	**BoS approved Date**
1. Strategy of the content delivery was altered with addition of structured queries. 2. DBMS Practice (16EARP306) is introduced to include demonstrations, experiments, structured enquiry and open-ended experiments to solve real world problems. The focus is given on database design and normalization. 3. Theory of stepper motors for robotics and industrial drives has been included – 20 Hours 4. Simulation and analysis of fluid power circuits using MATLAB has been added – 6 Hours. 5. Exercise on Hydraulic accumulator, Sequential control of drives, and control of hydraulic circuits using logic gates is added – 6 Hours. 6. Few concepts like dynamic programming and trees were added to address real world problems. 7. New topics related to High end processors and Micro-Python that is programming microcontrollers using python were introduced - 10 hours.	OOP and Python Practice 16EARP305(R) DBMS Practice 16EARP306(A) Power Electronics, Motors & Drives 16EARE301(R) Hydraulics and Pneumatics Lab – 16EARP302(R) Algorithm Analysis & Program Design 17EARC203 (R) Microcontrollers 17EARC207(R) Control Systems	**31-3-2018**

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8. Introduced the content related to controllers • Introduction of chapter on PID controller design • Topics namely, types of Controllers; Mathematical modeling of PID, ON-OFF controller, Effect of Proportional, Derivative and Integral elements on system behavior, Design of controller for simple applications are introduced. 9. Introduced a topic on state space and General State-Space Representation 10. New content for design and fabrication of PIC, Atmega328 development board and PIC programmer were introduced - 4 hours.	17EARC209 (R) Microcontrollers Lab 17EARP207(R)	

3. **Action Taken Report Approved in Board of Studies dated** 13-04-2019 **and implemented with effect from** June 2019

Observations/ Recommendations based on feedback	**POs impacted**
Employers Feedback: • Programming Skills especially of Non-IT Students needs improvement. • Logical Thinking needs improvement & more practice. • Practical Applications of Concepts / more hands on required- students are more theoretical • Fundamentals/Basics must be improved. • Projects Quality & Depth to be improved. • Emphasis on Problem Solving & alternate solutions needed. • Practical Applications of Concepts / more hands on required- students are more theoretical. • With respect to Projects - Implementing change in requirements -- is an important skill. • Students need to do more interesting projects. **Teachers Feedback (Pre-BoS ,MoM):** Machine Learning and ROS 16EARE403 • Students need to learn the latest technology subject like Machine learning. • The subject can be much appreciated by robotics students if subject is taught with Robot operating system Measurement System 16EARE401 • Sensors and Signal conditioning chapter and Data acquisition systems chapter was newly added.	PO1, PO2, PO3, PO4, PO5, PO10, PO11, PO12, PO13,PO14

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Measurement System 17EARC304

- Scope of subject based on measurement has been identified as one of the important aspects in the field of control systems for automation and robotics applications.

Mechatronics and Measurement Lab 17EARP303

- Need for Introduction of exercises on Electronic Measurements and Sensors is proposed.
- Need for introducing exercises in line with the curricular changes required to emphasize on model based design, sensors and measurements for simulation and hardware based experiments.

Machine Learning & ROS 17EARC305

- Required proficiency in addressing real world problems with improved learning ability for automation and robotics solutions.

Object Oriented Programming & Database Management Systems 17EARC301

- More emphasis on programming and database is required.

Mechatronics System Design 17EARC303

- Need for revising of chapters in line with the curricular changes required to emphasize on modeling, Electric Drives, Model based design of Systems and Identification and Case studies has to be taken up.
- Emphasis required on modeling and System Identification.

Object Oriented Programming & Database Management Systems Lab 17EARP301

- More emphasis on programming and database was suggested.

AI for Autonomous Robots 17EARE301

- Required proficiency in addressing real world problems with improved learning ability to design and implement intelligent solutions for automation and robotics problems.

Digital System Design and FPGA Programming 17EARE304

- Need for introduction of a course on Reconfigurable architectures, and FPGA Programming was proposed, in order to introduce concepts of Parallel computing and power-efficient architectures. This is in line with the requirements of recent trends in computing employed in Automation and Robotics applications.
- Need for introducing power-efficient architectures based on FPGA was proposed.

Hydraulics and Pneumatics 17EARC308

- Suggestions on the alteration of the existing syllabus were received indicating emphasis on core design aspects.

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Industrial Robotics Lab 17EARP306

- Use of RoboAnalyzer tool for building industrial robots in Industrial Robotics Lab was proposed.
- Scope of implementing Robotics toolbox in Industrial Robotics Lab was identified.

Analog and Digital Electronics 18EARC201

- Refining the flow of topics was suggested.
- Inclusion of a topic on integrated circuits was required.

Data Structures, Algorithm Design and Analysis 18EARC203.

- Required proficiency in programming to address the requirements of course offered from III semester onwards.

Object Oriented Programming & Database Management Systems 18EARC209

- Focus on implementation as it was crucial to crack the initial placement round.
- Required proficiency in programming to address the requirements of course offered from V semester onwards (internal discussion).

Object Oriented Programming & Database Management Systems Lab 18EARP209

- Focus on implementation was emphasized in order to help students crack the initial placement round.
- Required proficiency in programming to address the requirements of course offered from V semester onwards
- Reduce the number of programming languages

Microcontrollers Programming and Interfacing 18EARC208

- Students have to get exposure on advanced microcontrollers.

Control Systems 18EARC207

- Case studies of control systems play an important role in understanding the control systems concepts.

Microcontrollers Programming and Interfacing Lab 18EARP208

- Students needs to get hands on experience on IOT systems

Students Feedback:

- Reduction in the number of programming languages needed.

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Actions taken	Course Revised (R)/ Added (A)	BoS approved Date
1. New subject was introduced to understand machine learning with respect to the robot operating system has introduced. 2. Addition of Sensors and Signal conditioning chapter and Data acquisition systems chapter of 10 Hours to the existing syllabus. 3. The Measurement System as a course has been introduced for the academic year 2019-20 which is of 40 Hours syllabus. 4. Characterization of Sensor modules and study of sensor fusion techniques -6 hrs, System Identification of DC motor -6hrs 5. Developing of Data acquisition model in an embedded system(3hrs) 6. Topics related to the Robotic operating system were added. 7. The course was added to support the previously offered OOP & Python Practice (16EARP305) and DBMS Practice (16EARP306). 8. The new course included Java programming, Python programming and MySQL database. 9. Topics related Modeling of Processes, Model based Design of Systems & Identification and Case studies were added. 10. OOP & Python Practice (16EARP305) and DBMS Practice (16EARP306) were combined with demonstrations, experiments, structured enquiry and open-ended experiments on Java programming, Python programming and MySQL database. 11. Industry relevant context was introduced. 12. Topics related to Robotic architectures, artificial intelligence were added in the course AI for autonomous systems (17EARE301). 13. Digital System Design and FPGA Programming 17EARE304	Machine Learning and ROS 16EARE403(A) Measurement System 16EARE401(R) Machine Learning & ROS (A) 17EARC305 Object Oriented Programming & Database Management Systems 17EARC301(A) Object Oriented Programming & Database Management Systems Lab 17EARP301(A) AI for Autonomous Robots 17EARE301(R) Digital System Design and FPGA Programming 17EARE304(A) Hydraulics and Pneumatics 17EARC308(R) Industrial Robotics Lab (17EARP306)(R) Analog and Digital	13-04-2019

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Unit I:15 hours :Review of Logic Design Fundamentals, State machine Charts & Micro programming Unit II:15 hours: Designing with FPGA, Modeling and Design with HDL Unit III:10hrs : Testing and Verification, Case studies 14. Theory credits were reduced from 4-0-0 to 3-0-0, with more focus on Hydraulic Control Systems 15. Introduced topic related to Robo Analyzer tool - 9 hours, Introduced Robotics Toolbox by Peter Corke – 3 hours Include a topic on integrated circuits – 4 Hours 16. Programming with focus on concepts like inheritance, polymorphism and abstraction related to C++ were added. 17. Course was shifted to IV semester as courses from V semester onwards required proficiency in programming. 18. Theory credits were reduced from 4-0-0 to 3-0-0, with more focus on implementation as part of Lab 19. Number of programming languages reduced with focus solely on classical OOP and database 20. Content was rearranged 21. The lab was shifted to IV semester as courses from V semester onwards required proficiency in programming 22. The lab credits were increased from 0-0-1 to 0-0-2, with more focus on implementation as part of Lab. This required introduction of new demonstrations, experiments, and structured enquiry. 23. Number of programming languages reduced with focus solely on Visual Studio C++ and MySQL database, and deletion of Python programming content 24. New advanced microcontroller STMicroelectronics microcontroller was introduced that can be programmed using python.	Electronics 18EARC201(R) Data Structures, Algorithm Design and Analysis 18EARC203(R) Object Oriented Programming & Database Management Systems 18EARC209(R) Object Oriented Programming & Database Management Systems Lab 18EARP209(R) Microcontrollers Programming and Interfacing 18EARC208(R) Control Systems 18EARC207(R) Microcontrollers Programming and Interfacing Lab 18EARP208(R)	

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25. Case studies were introduced in unit-3, in Chapter No. 8: Case Studies. Plants for Pressure Control, Electromechanical Plants, Modeling and design of Inverted Pendulum, Modeling and design of Aircraft. 26. Lab experiments related to design and development of IOT systems and program development using of STM family of microcontrollers were introduced - 6 hours		

4. Action Taken Report Approved in Board of Studies dated 03-06-2020 **and implemented with effect from** July 2020

Observations/ Recommendations based on feedback	**POs impacted**
Employer Feedback: • Programming Skills especially of Non-IT Students needs improvement. • Logical Thinking needs improvement & more practice. • Practical Applications of Concepts / more hands on required- students are more theoretical • Projects Quality & Depth to be improved. • Emphasis on Problem Solving & alternate solutions needed. • Practical Applications of Concepts / more hands on required- students are more theoretical. • With respect to Projects - Implementing change in requirements is an important skill. • Students need to do more interesting projects **Teacher's Feedback:** Project 1 18EARW401 • Decision taken in the Pre-BOS meeting to add one more project activity in VII semester for improving complex problem solving skills for students opting for internship program in VIII semester.	PO1,PO2, PO3,PO4 PO5, PO9, PO10,PO11,PO12, PO13, PO14

Actions taken	**Course Revised (R)/ Added (A)**	**BoS approved Date**
1. New Project course was introduced in which the student has to select suitable complex problem and build solution for the same.	Project 1 18EARW401(A)	03-06-2020

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