Course Content

Course Code: 17EARC203	Course Title: **Algorithm Analysis & Program Design**	
L-T-P : 4-0-0	Credits: 4	Contact Hrs: 50
ISA Marks: 50	ESA Marks: 50	Total Marks: 100
Teaching Hrs: 50		Duration of ESA: 03 hours

Content	Hrs
Unit - 1	
Chapter 1: GENERAL PROBLEM SOLVING CONCEPTS- Problem Solving in Everyday Life, Types of Problems, Problem Solving with Computers - Problem Definition, Solution Design & Refinement, Testing Strategy Development, Program Coding and Testing, Using the Problem Solving Method, , Break-Out Diagrams**,** Difficulties with Problem Solving. How the Computer Stores Data, Functions-function prototypes, Operators, Expressions and Equations.	5 hrs
Chapter 2: SOLUTION PLANNING- Software Development Cycle,SDLC models, Requirement Modeling framework, Computer Communication methods, Unified modeling language: UML Building Blocks, UML Diagrams-Class Diagram, object diagram, component diagram, UML Modeling Types, UML Basic Notations, UML-SysML ,Using the Tools, Testing the Solution, Coding the Solution, Case studies- Modeling the sequence diagram for the Plant operation, Modeling the control strategy action	7hrs
Chapter 3: PROGRAMMING CONCEPTS FOR DESIGN AND ANALYSIS OF ALGORITHMS- Algorithms and Procedure oriented concepts, Object oriented programming concepts, data types, control structures, class and class concepts ,oop principles-inheritance,polymorphism,abstraction, exception handling mechanisms Their Representations, Modifying Algorithms, Alternative Algorithms. Review of Asymptotic Notations, Mathematical Analysis of Non-Recursive and Recursive Algorithms, Brute Force Approaches: Introduction, Selection Sort and Bubble Sort, Sequential Search and Brute Force String Matching , Divide and Conquer: General Method, Defective Chess Board, Binary Search, Merge Sort, Quick Sort and its performance.	8 hrs
Unit - 2	
Chapter 4: ARRAYS, STACKS & QUEUES: Arrays, Dynamically Allocated Arrays, , Polynomials, Sparse Matrices, Representation of Multidimensional Arrays, Structures and Unions, Stacks, Stacks Using Dynamic Arrays, Queues, Circular Queues, Evaluation of Expressions, Multiple Stacks and Queues, Single- and Double-Ended Priority Queues.	10 hrs
Chapter 5: LINKED LISTS, TREES & GRAPHS: Singly Linked lists and	10hrs

Chains, Representing Chains in C, Linked Stacks and Queues, Polynomials, Additional List operations, Sparse Matrices, Doubly Linked Lists. Introduction, Binary Trees, Binary Tree Traversals, Threaded Binary Trees, Heaps, Graph representation, Adjacency matrix, Adjancey list, Application of graphs.	
Unit - 3	
Chapter 6:DYNAMIC PROGRAMMING & GREEDY METHOD: Depth First Search and Breadth First Search, The General Method, Warshall's Algorithm, Floyd's Algorithm for the All-Pairs Shortest Paths Problem, Single-Source Shortest Paths, The Traveling Salesperson problem,Kruskal's algorithm, Huffman trees**.**	5 hrs
Chapter 7: LIMITATIONS OF ALGORITHMIC POWER AND COPING WITH THEM: Lower-Bound Arguments, Decision Trees, P, NP, and NP-Complete Problems, Challenges of Numerical Algorithms	5 hrs

Text Books (List of books as mentioned in the approved syllabus)

1. Horowitz, Sahni, Anderson-Freed: Fundamentals of Data Structures in C, 2nd Edition, Universities Press, 2007.
2. Maureen Sprankle, Jim Hubbard: "PROBLEM SOLVING & PROGRAMMING CONCEPTS", Pearson Publications, 9th edition, 2012.
3. Herbert Schildt " C++:The Complete Reference" ,McGraw-Hill,4th edition,2003

References

1. Yedidyah, Rubenstein, Tannenbaum: Data Structures Using C and C++, 2nd Edition, Pearson Education, 2003.
2. Anany Levitin: Introduction to The Design & Analysis of Algorithms, 2nd Edition, Pearson Education, 2007.

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Course Feedback

(To be filled by each Student at the time of Course Completion)

Dear Students,

Please give us your views on this Course so that the course quality can be improved. You are encouraged to be frank and constructive in your comments.

Course Teacher

Department/School A&R Name of the Teacher ASHWINI G K

Course Title ALGORITHM ANALYSIS AND PROGRAM DESIGN Course code: 17EARC203 Semester III 3rd

a. The design of the course	Strongly agree	Agree	Uncertain	Disagree	Strongly Disagree
The course objectives were clear		✓			
The course contents met with your expectation			✓		
The course work load was manageable		✓			
The lecture sequence was well planned to meet learning outcomes		✓			
The contents were illustrated with adequate examples	✓				
The course exposed you to new knowledge and practice	✓				
The level of the course was moderate		✓			

b. The conduct of the course	Strongly agree	Agree	Uncertain	Disagree	Strongly Disagree
The lectures were easy to understand & ideas and concepts presented clearly		✓			
The teaching aids were effectively used	✓				
The course material handed out was adequate		✓			
Were objectives of the course realized?	✓				
The overall environment in the class was conducive to learning		✓			

c. Learning Resources	Strongly agree	Agree	Uncertain	Disagree	Strongly Disagree
Learning materials (Lesson Plans, Course Notes etc.) were relevant and useful		✓			
Recommended reading Books etc. were relevant and appropriate		✓			
The provision of learning resources in the library was adequate and appropriate		✓			

d. Assessment	Strongly agree	Agree	Uncertain	Disagree	Strongly Disagree
The method of assessment were reasonable		✓			
Feedback on ISA assessment was timely		✓			
Feedback on ISA assessment was helpful		✓			

Suggestions for improvement:

Overall rating of the course: (✓ tick mark the appropriate)

90% -100% ☐ 80% - 90% ☐ 70% - 80% ☑ 60% - 70% ☐ 50% - 60% ☐ Below 50% ☐

Date: 4/12/2019

Signature

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Course Feedback

(To be filled by each Student at the time of Course Completion)

Dear Students,

Please give us your views on this Course so that the course quality can be improved. You are encouraged to be frank and constructive in your comments.

Course Teacher

Department/School AR Name of the Teacher _____

Course Title Algorithm Analysis and program design Course code: 17EARC203 Semester 3rd

a. The design of the course	Strongly agree	Agree	Uncertain	Disagree	Strongly Disagree
The course objectives were clear	✓				
The course contents met with your expectation		✓			
The course work load was manageable	✓				
The lecture sequence was well planned to meet learning outcomes		✓			
The contents were illustrated with adequate examples			✓		
The course exposed you to new knowledge and practice	✓				
The level of the course was moderate			✓		

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The teaching aids were effectively used	✓				
The course material handed out was adequate		✓			
Were objectives of the course realized?		✓			
The overall environment in the class was conducive to learning	✓				

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The provision of learning resources in the library was adequate and appropriate	✓				

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The method of assessment were reasonable	✓				
Feedback on ISA assessment was timely	✓				
Feedback on ISA assessment was helpful		✓			

Suggestions for improvement:

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90% -100% ☐ 80% - 90% ☑ 70% - 80% ☐ 60% - 70% ☐ 50% - 60% ☐ Below 50% ☐

Date: 4/10/2019

Signature

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Course Feedback

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Dear Students,

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Course Teacher

A&R

Department/School A&R Name of the Teacher Ashwini GIC

Course Title Algorithm Analysis & Programdesign Course code: 17EARC203 Semester III

a. The design of the course	Strongly agree	Agree	Uncertain	Disagree	Strongly Disagree
The course objectives were clear		✓			
The course contents met with your expectation		✓			
The course work load was manageable					
The lecture sequence was well planned to meet learning outcomes			✓		
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The course exposed you to new knowledge and practice			✓		
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Date: 9/12/2019

Signature

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Course Feedback

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Dear Students,

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Course Teacher

Department/School A&R Name of the Teacher Ashwini GK

Course Title Algorithm Analysis & program design Course code: 17EARCS203 Semester III

a. The design of the course	Strongly agree	Agree	Uncertain	Disagree	Strongly Disagree
The course objectives were clear		✓			
The course contents met with your expectation			✓		
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Date: 4/12/2019

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Recommended reading Books etc. were relevant and appropriate		✓			
The provision of learning resources in the library was adequate and appropriate	✓	✓			

d. Assessment	Strongly agree	Agree	Uncertain	Disagree	Strongly Disagree
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Date: / /2019

Signature

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Alumni Survey Form

Dear proud alumni ,

The following are the list of skills and competencies that engineering graduates should have. We seek your participation in the Alumni Survey conducted to know your satisfaction with the *level of competency* you have achieved as a result of your education at the Institution and also able to practice the same. For each question, indicate your answer with symbol "A" in the appropriate column/box. All individual responses will be kept confidential. Only statistically analyzed results from the entire population will be shared.

Regards,
Head of the department/School

S.No	Competencies	Level of Competency			
		Completely Dissatisfied	Dissatisfied	Satisfied	Completely Satisfied
1	**Engineering knowledge :**				
	Ability to apply the knowledge of mathematics, science, engineering fundamentals, and engineering specialization for the solution of engineering problems			✓	
2	**Problem analysis:**				
	Ability to identify, characterize and formulate a solution plan for solving engineering problems			✓	
	Ability to execute a solution process and analyse results				✓
3	**Design/Development of Solutions:**				
	Ability to design components, systems or processes that meet specified needs, following appropriate engineering design process			✓	
4	**Conduct investigations of complex problems:**				
	Ability to conduct investigations or tests through design of experiments to understand and solve engineering problems			✓	
	Ability to critically analyse and interpret data to reach valid conclusions			✓	
5	**Modern tool usage:**				
	Ability to identify / create and use appropriate modern engineering and IT tools, techniques and resources to solve engineering problems			✓	

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Alumni Survey Form

6	**The engineer and society:**				
	Demonstrate an understanding of professional engineering regulations, legislation and standards			✓	
7	**Environment and sustainability:**				
	Ability to 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:**				
	Ability to apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice				✓
9	**Individual and team work:**				
	Ability to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings				✓
10	**Communication:**				
	Ability to comprehend technical literature and prepare effective reports and design documents			✓	
	Demonstrate competence in listening, speaking, and presentation				✓
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			✓	
13	**Modeling and Design**				
	An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.		✓		
14	**Construction of software system**				
	An ability to apply design and development principles in the construction of software systems of varying complexity.			✓	

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Alumni Survey Form

Indicate your Answer with symbol "A" in the appropriate box.

1) How would you rate your overall satisfaction with your preparation to become an engineer?

Not Satisfied		Little Satisfied		Satisfied	✓	Very Satisfied		Very Satisfied	

2) In general, the department has provided a _____ quality academic program?

Poor		OK		Good	✓	Very Good		Very Good	

Name: Saatvika . J. Godihal	Branch: Automation and Robotics
e-mail id: saatvikagodihal98@gmail.com	Batch: 2019
Name of the company: ~~BOSCH~~	
Correspondence Address: 5101, prestige royal gardens, doddaballapur road, avalahelli, bengaluru - 560064.	
Signature: Saatvika	

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10	**Communication:**				
	Ability to comprehend technical literature and prepare effective reports and design documents			✓	
	Demonstrate competence in listening, speaking, and presentation				
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				✓
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14	**Construction of software system**				
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Not Satisfied ☐ Little Satisfied ☐ Satisfied ☑ Very Satisfied ☐

2) In general, the department has provided a _____ quality academic program?

Poor ☐ OK ☐ Good ☐ Very Good ☑

Name: Panchami. K. Shanbhag	Branch: Automation & Robotics
e-mail id: itsmepanchi.s@gmail.com	Batch: 2015 - 2019
Name of the company:	
Correspondence Address: B/203, Siddhivinayak Garden C.H.S, Opp Classic Hotel, Shiv Vallabh Road, Ashokvan, Dahisar (E), Mumbai - 400 068.	
Signature:	

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2) In general, the department has provided a _____ quality academic program?

Poor ☐ OK ☐ Good ☐ Very Good ☑

Name: Ranajit chavan	Branch: Automation Robotics
e-mail id: ranajitchavan123@gmail.com	Batch: 16-2019
Name of the company: Multitech Automations	
Correspondence Address: Renuka nivas Basav nagar Athani - 591304	
Signature: Rchavan	

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Alumni Survey Form

Indicate your Answer with symbol "A" in the appropriate box.

1) How would you rate your overall satisfaction with your preparation to become an engineer?

Not Satisfied ☐ Little Satisfied ☐ Satisfied ☑ Very Satisfied ☐

2) In general, the department has provided a _____ quality academic program?

Poor ☐ OK ☐ Good ☐ Very Good ☑

Name: Yash.M.Bafna	Branch: A&R
e-mail id: yashbafna6@gmail.com	Batch: 2015-2019
Name of the company: -	
Correspondence Address: #1, Gurudev Nagar, Near CDO Jain school road, Gadag-582101	
Signature:	

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KLE Society's
B V Bhoomaraddi College of Engineering & Technology, Hubli

Alumni Survey Form

Dear proud alumni ,

The following are the list of skills and competencies that engineering graduates should have. We seek your participation in the Alumni Survey conducted to know your satisfaction with the *level of competency* you have achieved as a result of your education at the Institution and also able to practice the same. For each question, indicate your answer with symbol "A" in the appropriate column/box. All individual responses will be kept confidential. Only statistically analyzed results from the entire population will be shared.

Regards,
Head of the department/School

S.No	Competencies	Level of Competency			
		Completely Dissatisfied	Dissatisfied	Satisfied	Completely Satisfied
1	**Engineering knowledge :**				
	Ability to apply the knowledge of mathematics, science, engineering fundamentals, and engineering specialization for the solution of engineering problems			✓	
2	**Problem analysis:**				
	Ability to identify, characterize and formulate a solution plan for solving engineering problems			✓	
	Ability to execute a solution process and analyse results			✓	
3	**Design/Development of Solutions:**				
	Ability to design components, systems or processes that meet specified needs, following appropriate engineering design process			✓	
4	**Conduct investigations of complex problems:**				
	Ability to conduct investigations or tests through design of experiments to understand and solve engineering problems			✓	
	Ability to critically analyse and interpret data to reach valid conclusions				✓
5	**Modern tool usage:**				
	Ability to identify / create and use appropriate modern engineering and IT tools, techniques and resources to solve engineering problems			✓	

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Alumni Survey Form

6	**The engineer and society:**				
	Demonstrate an understanding of professional engineering regulations, legislation and standards			✓	
7	**Environment and sustainability:**			✓	
	Ability to 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:**				
	Ability to apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice			✓	
9	**Individual and team work:**				
	Ability to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings				✓
10	**Communication:**				
	Ability to comprehend technical literature and prepare effective reports and design documents			✓	
	Demonstrate competence in listening, speaking, and presentation			✓	
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			✓	
13	**Modeling and Design**				
	An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.			✓	
14	**Construction of software system**				
	An ability to apply design and development principles in the construction of software systems of varying complexity.			✓	

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Engineering & Technology, Hubli

Alumni Survey Form

Indicate your Answer with symbol "A" in the appropriate box.

1) How would you rate your overall satisfaction with your preparation to become an engineer?

Not Satisfied [ ] Little Satisfied [ ] Satisfied [A] Very Satisfied [ ]

2) In general, the department has provided a _____ quality academic program?

Poor [ ] OK [ ] Good [A] Very Good [ ]

Name: Roshan. S. Andrews	Branch: A&R
e-mail id: roshansa96@gmail.com	Batch: 2015-19
Name of the company: Multitech Automations	
Correspondence Address: #88, Nishka Nilaya, Kanaka layout, Kadirinahali, 9 BSK II stage, Bloxe - 560070	
Signature:	

KLE Technological University
DEPARTMENT OF AUTOMATION & ROBOTICS

FMTH0302 Rev. 1.2

LESSON PLAN/LABORATORY PLAN/ LABORATORY MANUAL REVIEW REPORT

Department: Automation and Robotics
Semester: III

Course: UG
Year: 2018

Sl. No.	Name of the Lesson/ Laboratory Plan Author(s)	Sem.	Subject/Lab. Code	Language			Content			Hours allotment		Corrective Measures
				Poor	Adequate	Good	Poor	Adequate	Good	Unsatisfactory	Satisfactory	
1	Analog & Digital Electronic Circuits	III	17EARC201									
2	Mechanics Of Materials	III	17EARC202									
3	Algorithm Analysis And Program Design	III	17EARC203			✓		✓			✓	Needs to update the course content
4	Machine Design	III	17EARC204									
5	Analog And Digital Electronic Circuits Lab	III	17EARP201									
6	Machine Drawing Lab	III	17EARP202									
7	Programming Lab	III	17EARP203									

*Whether the relevant **codes/standards** (latest versions) were available [Mention the Lab code]? YES/NO* *Lab. Code(s):*

Comments:

Signature of Committee Members:

Copy to - Concerned staff members

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DEPARTMENT OF AUTOMATION AND ROBOTICS

Dear proud alumni,

The following are the list of skills and competencies that engineering graduates should have. We seek your participation in the Alumni Survey conducted to know your satisfaction with the *level of competency* you have achieved as a result of your education at the Institution and also able to practice the same. For each question, indicate your opinion with a tick mark (✓) in the appropriate column. All individual responses will be kept confidential. Only statistically analyzed results from the entire population will be shared.

Regards,

Head, Department of Automation & Robotics

S.No	Competencies	Level of Competency			
		Completely Dissatisfied	Dissatisfied	Satisfied	Completely Satisfied
1	**Engineering knowledge :**				
	Ability to apply the knowledge of mathematics, science, engineering fundamentals, and engineering specialization for the solution of engineering problems	1	7	17	15
2	**Problem analysis:**				
	Ability to identify, characterize and formulate a solution plan for solving engineering problems	0	6	26	8
	Ability to execute a solution process and analyse results	1	4	25	10
3	**Design/Development of Solutions:**				
	Ability to design components, systems or processes that meet specified needs, following appropriate engineering design process	0	4	21	15
4	**Conduct investigations of complex problems:**				
	Ability to conduct investigations or tests through design of experiments to understand and solve engineering problems	1	6	24	9
	Ability to critically analyse and interpret data to reach valid conclusions	1	2	27	10
5	**Modern tool usage:**				
	Ability to identify / create and use appropriate modern engineering and IT tools, techniques and resources to solve engineering problems	2	3	25	10
6	**The engineer and society:**				
	Demonstrate an understanding of professional engineering regulations, legislation and standards	1	3	15	21

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7	**Environment and sustainability:**	Completely Dissatisfied	Dissatisfied	Satisfied	Completely Satisfied
	Ability to understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development	1	3	22	14
8	**Ethics:**				
	Ability to apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice	2	2	15	21
9	**Individual and team work:**				
	Ability to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings	1	2	19	18
10	**Communication:**				
	Ability to comprehend technical literature and prepare effective reports and design documents	0	1	27	12
	Demonstrate competence in listening, speaking, and presentation	1	1	15	23
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	1	7	15	17
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	1	6	19	14
13	**Foundations of robotics:**				
	Identify the needs, analyze, design and develop simple robotic systems and programs for diverse applications.	1	8	17	14
14	**Integration and applications of automation and robotics:**				
	Identify the needs, design, select and integrate appropriate automation and robotic subsystems for diverse applications.	1	7	23	9

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PO	Completely Dissatisfied CD	Dissatisfied D	Satisfied S	Completely Satisfied CS	CD + D
1	1	7	17	15	**8**
2	0	6	26	8	6
	1	4	25	10	5
3	0	4	21	15	4
4	1	6	24	9	7
	1	2	27	10	3
5	2	3	25	10	5
6	1	3	15	21	4
7	1	3	22	14	4
8	2	2	15	21	4
9	1	2	19	18	3
10	0	1	27	12	1
	1	1	15	23	2
11	1	7	15	17	**8**
12	1	6	19	14	**7**
13	1	8	17	14	**9**
14	1	7	23	9	**8**

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Automation & Robotics
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Consider where more than 20% respondents were not satisfied with the level of competency they attained.

PO	Competencies	%
1	Engineering knowledge	8
11	Project management and finance	8
12	Life-long learning	7
13	Foundations of robotics	9
14	Integration and applications of automation and robotics	8

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KLE Technological University
DEPARTMENT OF AUTOMATION & ROBOTICS

FMTH0302 Rev. 1.2

LESSON PLAN/LABORATORY PLAN/ LABORATORY MANUAL REVIEW REPORT

Department: Automation and Robotics
Semester: III

Course: UG
Year: 2018

Sl. No.	Name of the Lesson/ Laboratory Plan Author(s)	Sem.	Subject/Lab. Code	Language			Content			Hours allotment		Corrective Measures
				Poor	Adequate	Good	Poor	Adequate	Good	Unsatisfactory	Satisfactory	
1	Analog & Digital Electronic Circuits	III	17EARC201									
2	Mechanics Of Materials	III	17EARC202									
3	Algorithm Analysis And Program Design	III	17EARC203			✓		✓			✓	Needs to update the course content
4	Machine Design	III	17EARC204									
5	Analog And Digital Electronic Circuits Lab	III	17EARP201									
6	Machine Drawing Lab	III	17EARP202									
7	Programming Lab	III	17EARP203									

*Whether the relevant **codes/standards** (latest versions) were available [Mention the Lab code]? YES/NO* *Lab. Code(s):*

Comments:

Signature of Committee Members:

Copy to - Concerned staff members

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13th April 2019

Agenda

Sl.No	Points to discuss	Documents
1.	Introduction & Review of Actions initiated from previous BOS meeting	Curriculum structure & Syllabus
2.	Review of modifications recommended by the Academic Council or the Principal after BOS 2019.	
3.	General Points	
4.	Review and approval of Syllabi for VII & VIII Semester of the batch 2016-20 , KLE Tech.	
5.	Review and approval of Syllabi for V & VI Semester of the batch 2017-21 , KLE Tech.	
6.	Review and approval of Syllabi for III & IV Semester of the batch 2018-22 , KLE Tech.	
7.	Other points	

Minutes Prepared by

Jyoti Bali

Prof. A. C. Giriyapur

Chairperson, HOD, A&R

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Sl.No	Points raised	Changes made	Raised By
1.0 General points	• HOD welcomed members of Fourth BOS-2019 for KLE Tech • Reviewed the minutes of BOS 2018. • Review of modifications recommended by the Academic Council or the Principal after BOS 2018. • Reviewed the verticals of the department. • Reviewed the curriculum structure and credit distribution. • Discussed about final year project/internship/industry internship. • Involved project based learning in theory and lab courses. • A & R department established Center for Automation Systems Engineering consultancy. • All BOS documents should have page numbers. • Briefing of Students achievements 1. Participation of Student Team on Delta Robot exhibited at FIESTA-2018 in South Korea 2. Student Participation in Robocon-2019 at Pune. 3. Development of Basic version of Humanoid Robot under capstone project 4. Projects problems taken up for VRL Transport Company.	Review done and action planned	Dr. Dhanesh Manik, IIT Bombay. Mr. Abhijit Lele Robert Bosch India. Mr. Sachinkumar Gorlewar Mr. Supreet Kamatagi, Griffyn Robotech Pvt. Ltd.
2.0 Curriculum & Syllabus	• **Review of Syllabi for III & IV Semester of the batch 2018-22, KLE Tech.** • Suggested to Combine Machine Drawing and Manufacturing Lab. Course content related to Machine drawing and Manufacturing lab to be proposed and sent to external BOS members for approval. IP Protections can be included in Machine Drawing lab. • Suggested changes in the course content of Microcontrollers to be proposed and sent to external	Review done and action planned	Dr. Dhanesh Manik, IIT Bombay. Mr. Abhijit Lele Robert Bosch India. Mr. Sachinkumar Gorlewar Mr. Supreet Kamatagi,

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	BOS members for approval. • Reviewed and approved the course content of Kinematics and Dynamics of Machinery theory and Lab. • Suggested changes in the course content of Real Time Embedded system to be proposed and sent to external BOS members for approval. Suggested to change the approach of delivery in the course of Real Time Embedded system.		Griffyn Robotech Pvt. Ltd.
3.0	• **Review of Syllabi for V & VI Semester of the batch 2017-21, KLE Tech.** • Object Oriented Programming & Database Management Systems 17EARC301 (50 hours): The course was newly created to support the previously offered OOP & Python Practice (16EARP305) and DBMS Practice (16EARP306). The new course included Java programming, Python programming and MySQL database. Overall, 50 hours of content was newly created.	Review done and action planned	Dr. Dhanesh Manik, IIT Bombay. Mr. Abhijit Lele Robert Bosch India Mr. Sachinkumar Gorlewar Mr. Supreet Kamatagi, Griffyn Robotech Pvt. Ltd.
4.0	• **Summary of changes proposed in different courses** **Batch 2016-20, VII Sem** Machine Learning and ROS 16EARE403 (40 hours) Topics related to Robot operating system[5 hours]: messages, classes, and servers[5 hours] were introduced and topics related to machine learning[5hours], computational learning theory[4hours], decision tree[4 hours], kernel methods[7 hours], reinforcement learning[5hours], and ANN[5 hours] were added. Measurement System 16EARE401 (40 hours) Measurement as an elective has been introduced for the academic year based on the inputs of the department committee and topics added are -.Chapter1. Introduction to Measurement Systems (5 hrs), Chapter No. 2. Sensors and Signal conditioning (5 hrs), Chapter No. 3. Motion Measurement (5 hrs), Chapter No. 4. Force, Torque, and Shaft Power Measurement(5 hrs), Chapter No. 5. Pressure &	Review done and action planned	Dr. Dhanesh Manik, IIT Bombay. Mr. Abhijit Lele Robert Bosch India Mr. Sachinkumar Gorlewar Mr. Supreet Kamatagi, Griffyn Robotech Pvt. Ltd.

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	Sound Measurement(5 hrs), Chapter No. 6. Flow and Temperature Measurement(5 hrs), Chapter No.7. Data Acquisition Systems(5 hrs), Chapter No. 8. Transmission and Recording of Data(5 hrs). **Batch 2017-21 , V Sem** Measurement System 17EARC304 (40 hours) Chapter No. 1. Introduction to Measurement Systems (5 hrs), Chapter No. 2. Sensors and Signal conditioning (5 hrs), Chapter No. 3. Motion Measurement (5 hrs), Chapter No. 4. Force, Torque, and Shaft Power Measurement(5 hrs), Chapter No. 5. Pressure & Sound Measurement(5 hrs), Chapter No. 6. Flow and Temperature Measurement(5 hrs), Chapter No.7. Data Acquisition Systems(5 hrs), Chapter No. 8. Transmission and Recording of Data(5 hrs). Mechatronics and Measurement Lab 17EARP303-12 hours Exercise on Sensors and Sensor Modeling-4 hrs , Exercise on Transfer Functions & Model based design- 4hrs, Exercise on System Identification and Parametrization :4hrs Machine Learning & ROS 17EARC305 (40 hours) Topics related to the Robotic operating system were added- ROS services, ROS messages, ROS publisher and subscriber and various simulation tools were added. Chapter 1:Introduction to Robot operating system [5hrs],Chapter 2:Messages, Classes and Servers in ROS[5hrs], Chapter 3: Introduction to machine learning [5hrs],Chapter 4: Computational learning theory and decision tree learning[8hrs],Chapter 5:Kernel methods and Graphical models[7hrs],Chapter 6:Reinforcement Learning[5hrs],Chapter 7: Artificial neural network[5hrs] Object Oriented Programming & Database Management Systems 17EARC301 (50 hours) The course was newly created to support the previously offered OOP & Python Practice (16EARP305) and DBMS Practice (16EARP306). The new course included Java programming, Python programming and MySQL database. Overall, 50 hours of content was newly created. Chapter 1: Introduction to Software Development Lifecycle and Unified Modeling Language (6 hrs), Chapter 2: Data Modeling using the ER Model (6 hrs), Chapter 3: Introduction to Object-		Dr. Dhanesh Manik, IIT Bombay. Mr. Abhijit Lele Robert Bosch India Mr. Sachinkumar Gorlewar Mr. Supreet Kamatagi, Griffyn Robotech Pvt. Ltd.

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	Oriented Programming - I (8 hrs), Chapter 4: Object-Oriented Programming - II (4 hrs), Chapter 5: Object-Oriented Programming - III (10 hrs), Chapter 6: Introduction to Database Management Systems (6 hrs), Chapter 7: Relational Data Model (5 hrs) and SQL and Chapter 8: Object-Relational Databases and Semantic Modeling Approach (5 hrs) Mechatronics System Design 17EARC303 (20 hours) Introduced additional topics under : System Modeling : 5 hrs, Electric Drives- 10 hrs, Model based design of Systems and Identification and Case studies -5hrs Object Oriented Programming & Database Management Systems Lab 17EARP301 (24 hours) The lab was newly created to complement the new course on Object Oriented Programming & Database Management Systems (17EARC306). The lab focused on Java programming, Python programming and MySQL database with emphasis on industry relevant context. Overall, 7 experiments or 13 lab sessions were introduced. **Batch 2017-21 , VI Sem** AI for Autonomous Robots 17EARE301 (40 hours) Topics related robotics paradigms ,robotic architectures-Hierarchical paradigm,reactive paradigm and deliberative paradigm ,animal models based algorithms,multi agents and navigation and localizations methods were added under the chapters- 1: Introduction to Artificial intelligence and autonomous systems [5hrs],Chapter 2: Robotic software architectures[5hrs],Chapter 3: Biological Foundations of the Reactive Paradigm,Chapter 4: Capturing intelligence - Designing a reactive implementation with common sensing techniques for robotics perception[8hrs],Chapter 5: Multi-agents and navigation in robotics[7hrs],Chapter 6:Localization and Map Making[6hrs],Chapter 7: Deep learning and natural language processing[4hrs] Digital System Design and FPGA Programming 17EARE304 (40 hours) Chapter 1. Review of Logic Design Fundamentals: 9 hours, Chapter 2. Introduction to State Machine Charts and		Dr. Dhanesh Manik, IIT Bombay. Mr. Abhijit Lele Robert Bosch India Mr. Sachinkumar Gorlewar Mr. Supreet Kamatagi, Griffyn Robotech Pvt. Ltd.

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	Microprogramming: 6hrs,Chapter 3. Designing with Field Programmable Gate Arrays: Chapter 4. Modeling and design with HDL -8 hrs,Chapter 5. Testing and Verification-5 hrs,Case studies on FPGA technologies in Automation and Robotics applications -5 hrs Hydraulics and Pneumatics 17EARC308 (10 hours) Topics related to Hydraulic System Maintenance (5 hours) and few topics related to hydraulics control system (5 hours) were not included in the syllabus. Industrial Robotics Lab 17EARP306 (12 hours) Robotics Toolbox by peter corke was added to solve problems on orientation and pose in 2D and 3D (SO (2), SE (2), SO (3), SE (3)) as matrices, quaternions, twists, triple angles, and matrix exponentials. RoboAnalyzer tool was introduced in the lab to perform kinematic analysis of industrial robots (4 - DOF, and 6 DOF), Forward and Inverse kinematics analysis, Transformation matrix (2D and 3D), Path generation and building custom robots. Topics regarding Reachability and Multimove by using Robotstudio were added. 2018-22 batch, III Sem Analog and Digital Electronics 18EARC201 (12 hours) **Data conversions - 6hours, Digital integrated circuits - 6hrs** Data Structures, Algorithm Design and Analysis 18EARC203. (12 hours) Topics related to C++ programming were added-class and objects, abstractions, polymorphism, encapsulation and inheritance ,types of inheritance under the chapters Chapter 6: Introduction to C++[6 hrs],Chapter 7: Basic oopS concepts [6 hrs] 2018-22 batch, IV Sem Object Oriented Programming & Database Management Systems 18EARC209 (20 hours) Course was shifted to IV semester as courses from V semester onwards required proficiency in programming.		Dr. Dhanesh Manik, IIT Bombay. Mr. Abhijit Lele Robert Bosch India Mr. Sachinkumar Gorlewar Mr. Supreet Kamatagi, Griffyn Robotech Pvt. Ltd.

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	Additionally, the number of programming languages were reduced with focus solely on classical OOP and databases. This required deletion of Chapter 5: Object Oriented Programming-III (10 hrs), Chapter 7: Relational Data Model and SQL (5 hrs) and Chapter 8: Object-Relational Databases and Semantic Modeling Approach (5 hrs). The deletion of some DBMS content was shifted to the lab with a more hands-on approach, and some to Chapter 5: Entity Relationship (ER) Model (3 hrs) and Chapter 6: Database Management System (2 hrs). Also, the content was adjusted to teach classical OOP instead of java specific, and introduced the concepts of cloud computing as part of Chapter 7: Cloud Computing (5 hrs). Object Oriented Programming & Database Management Systems Lab 18EARP209 (24 hours) Python related experiments and Java related experiments (3 labs or 6 hours) were adapted to work on experiments related to classical OOP. The lab experiments were enhanced to include additional experiments on classical OOP, file handling and user interfaces. Microcontrollers Programming and Interfacing 18EARC208 (12 hours) Exposure to advanced microcontrollers [2 hours], the topics related to STmicroelectronics microcontrollers [5 hours] and programming using timers and interrupts [5 hours] were added. **Control Systems 18EARC207 (12 hours)** Root Locus: Incorporation of Performance Specifications in Controller Design, Analysis of Steady State Errors, Root Locus and its Application in Control Design. (3 hrs) , Case Studies of control systems were introduced. Some important case studies are on Plants for Pressure Control, Electromechanical Plants, Modeling and design of Inverted Pendulum, Modeling and design of Aircraft. (5 hrs) Controllers – Proportional (P), Integral (I) and Derivative (D) Blocks, Examples of PID controller design, Problems. (4 hrs) Microcontrollers Programming and Interfacing Lab 18EARP208 SD (8 hours)		Dr. Dhanesh Manik, IIT Bombay. Mr. Abhijit Lele Robert Bosch India Mr. Sachinkumar Gorlewar Mr. Supreet Kamatagi, Griffyn Robotech Pvt. Ltd.

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	Experiments related to development of IOT systems[3 hours], interrupt programming with STM MCU [2 hours], and development of applications using STM MCU to predict the data using the existing trained module[3 hours] were introduced.		

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Changes made in Curriculum Content for III and IV Semester of batch 2018-22, IV & V Semester of the batch 2017-21, VII & VIII Semester of the batch 2016-20, in IV BOS held in Mechanical Library on 13th April 2019.

Approved by:

Sl No	Members, BOS	Signature
1	Prof. A. C. Giriyapur, Chairperson, HOD, A & R Dept.	
2	Dr. Dhanesh Manik, IIT Bombay.	
3	Mr. Abhijit Lele, Robert Bosch India.	
4	Mr. Sachinkumar Gorlewar, Griffyn Robotech Pvt. Ltd.	
5	Mr. Supreet Kamatagi, Griffyn Robotech Pvt. Ltd.	
6	Mrs. Jyoti Bali, A & R Dept.	
7	Mr. Vinod Kumar V Meti, A & R Dept.	
8	Mr. Nagaraj M B, A & R Dept.	
9	Mr. Sachin Karadgi, A & R Dept.	

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Resolutions Made During the 4th Board of Studies Meeting held on 13th April 2019 in Mechanical Library.

1. Resolved to approve Syllabi for III and IV Semester of batch 2018-22, KLE Tech., as per the changes suggested by external and internal members.
2. Resolved to approve Syllabi for V & VI Semester of the batch 2017-21, KLE Tech., as per the changes suggested by external and internal members.
3. Resolved to approve Syllabi for VII & VIII Semester of the batch 2016-20, KLE Tech., as per the changes suggested by external and internal members.

Changes made in the Curriculum Content for III and IV Semester of the batch 2018-22, V & VI Semester of the batch 2017-21, VII & VIII Semester of the batch 2016-20, in 4th BOS held in Mechanical Library on 13th April 2019.

The suggested changes in the content of all the courses and laboratories discussed in the BOS meeting are attached with this document.

Approved by:

Sl No	Members, BOS	Signature
1	Prof. A. C. Giriyapur, Chairperson, HOD, A & R Dept.	
2	Dr. Dhanesh Manik, IIT Bombay.	
3	Mr. Abhijit Lele, Robert Bosch India.	
4	Mr. Sachinkumar Gorlewar, Griffyn Robotech Pvt. Ltd.	
5	Mr. Supreet Kamatagi, Griffyn Robotech Pvt. Ltd.	
6	Mrs. Jyoti Bali, A & R Dept.	
7	Mr. Vinod Kumar V Meti, A & R Dept.	
8	Mr. Nagaraj M B, A & R Dept.	
9	Mr. Sachin Karadgi, A & R Dept.	

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KLE Society's
KLE Technological University
DEPARTMENT OF AUTOMATION & ROBOTICS

Department of Automation & Robotics
Structure of Board of Studies 2019-20, 13th April 2019

S. No.	Category	Nomination of the Committee		Name of the Person	Signature
1	Concerned Head of the Department/ School/ Center	Chairperson	1	Arunkumar C Giriyapur	
2	ONE Professor, ONE Associate Professor and ONE Assistant Professor from the Department/ School/ Center, nominated by the Dean Academic Affairs	Members		Mrs Jyoti Bali	
				Mr. Vinod Kumar V Meti	
				Mr. Nagaraj.M.B	
				Mr.Sachin Karadgi	
3	ONE PG Coordinator for each of the PG programmes offered by the Department/ School/ Center	Member(s)	1		
			2		
3	TWO Subject experts from outside the college nominated by the Vice-Chancellor	Members	1	Dr. Dhanesh Manik, IIT Bombay.	
			2		
4	TWO representative from industry corporate sector/ allied area relating to placement nominated by the Vice-Chancellor	Members	1	Mr. Abhijit Lele, Robert Bosch India.	
			2	Mr. Sachinkumar Gorlewar, Griffyn Robotech Pvt. Ltd.	
5	ONE Post-graduate meritorious alumnus nominated by the Vice-Chancellor	Member	1	Mr. Supreet Kamatagi	
6	ONE Student Member representing each of the program offered by the Department/ School/ Center	Invited Member	1	UG Student (Not Applicable at present)	
			2	PG Student (Not Applicable at present)	
			3	PhD Student (Not Applicable at present)	

The concerned Chairman of Board of Studies may invite additional experts to the Departmental Board of Studies as deemed fit.

A Departmental Board of Studies shall:
Meet at least once a year, sufficiently before the commencement;
Prepare detailed curricula and syllabi of concerned Programmes and submit to the Academic Council for approval and publication; and
Revise the curricula and syllabi from time to time and submit to the Academic Council for approval and publication

COURSE WITH COURSE CODE	Semester 2018-22 Batch					
	III	IV	V	VI	VII	VIII
	Statistics And Integral Transforms	Numerical Methods and Partial differential equations	Robot analysis & design	Realtime Embedded Systems	Industrial Data Networks	Department Elective-6
	Calculus And Integral Transforms	Vector calculus and differential	Mechatronics System Design	Programming Industrial Automation Systems	Department Elective-3	Open Elective
	Analog & Digital Electronic Circuits	Kinematics Of Machinery	Microcontrollers	Department Elective-1	Department Elective-4	Project
	Mechanics Of Materials	Control Systems	Artificial Intelligence & Machine Learning	Department Elective-2	Department Elective-5	Internship
	Algorithm Analysis And Program Design	Machine Design	Hydraulics & Pneumatics	PA & LR	Open Elective	Industry Internship - Project Work
	Manufacturing Technology	Measurement systems	Microcontroller Lab	Automation Lab	CIPE	
	Analog And Digital Electronic Lab	Object Oriented System Design	Robotics Lab	Hydraulics And Pneumatics Lab		
	Machine Drawing & Manufacturing Technology Lab	OOSD Lab	Mechatronics & Measurements Lab	Realtime Embedded Systems Lab		
		Kinematics Lab	Mini Project (Engineering Design Practice)	Minor project		

Approved by (Use Initials)	DR. Dhanesh Manik	Mr. Abhijit Lele	Mr. Sachinkumar	Supreet Kamatagi	A.C.Giriyapur	Jyoti Bali	Vinod Meti	Nagaraj MB	Sachin Karadgi
Signature	Dhanesh Manik	A.M.Lele							

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Course with course code	Semester 2017-21 Batch					
	III	IV	V	VI	VII	VIII
	Statistics And Integral Transforms	Numerical Methods and Partial differential equations	Robot analysis & design	Hydraulics & Pneumatics	Industrial Data Networks	Department Elective-6
	Calculus And Integral Transforms	Vector calculus and differential	Mechatronics System Design	Realtime Embedded Systems	Department Elective -3	Open Elective
	Analog & Digital Electronic Circuits	Kinematics Of Machinery	Programming Industrial Automation Systems	Department Elective -1	Department Elective -4	Project
	Mechanics Of Materials	Microcontrollers	Robotics Lab	Department Elective -2	Department Elective -5	Internship
	Algorithm Analysis And Program Design	Control Systems	Mechatronics & Measurement Lab	Hydraulics And Pneumatics Lab	Open Elective	Industry Internship - Project Work
	Machine Design	Manufacturing Technology	Automation Lab	Realtime Embedded Systems Lab	CIPE	
	Analog And Digital Electronic Circuits Lab	Manufacturing & Metrology lab	Measurements	Artificial Intelligence & Machine Learning		
	Machine Drawing Lab	Kinematics Lab	Object Oriented System Design	Minor project		
	Programming Lab	Microcontroller Lab	OOSD Lab	PA & LR		
			Engineering Design (Mini project)			

Approved by (Use Initials)	DR. Dhanesh Manik	Mr. Abhijit Lele	Mr. Sachinkumar	Supreet Kamatagi	A.C.Giriyapur	Jyoti Bali	Vinod Meti	Nagaraj MB	Sachin Karadgi
Signature									

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Course with course code

Semester 2016-20 Batch					
III	IV	V	VI	VII	VIII
Statistics and integral transforms Calculus and integral transforms	Numerical Methods and partial differential equations Vector calculus and differential	Robot analysis & design	Hydraulics & Pneumatics	Industrial Data Networks	Department Elective -6
Analog & Digital Electronic circuits	Kinematics of Machinery	Mechatronics System Design	Real Time Embedded Systems	Department Elective -3	Open Elective
Mechanics of Materials	Microcontrollers	Programming Industrial Automation Systems	Department Elective -1	Department Elective -4	Project
Manufacturing Technology	Machine Design	Robotics Lab	Department Elective -2	Department Elective -5	Internship
Algorithm analysis & program design	Control systems	Mechatronics Lab	Hydraulics & Pneumatics Lab	Open Elective	Industry Internship - Project Work
Engineering Design	Manufacturing & Metrology lab	Automation Lab	Real Time Embedded Systems Lab	CIPE	
Analog & Digital electronics lab	Kinematics lab	OOP & Python Practice	Minor project		
Programming Lab	Microcontroller Lab	DBMS Practice	PA & LR		
	Product Realization	Mini project			

Approved by (Use Initials)	DR. Dhanesh Manik	Mr. Abhijit Lele	Mr. Sachinkumar	Supreet Kamatagi	A.C.Giriyapur	Jyoti Bali	Vinod Meti	Nagaraj MB	Sachin Karadgi
Signature		A.M.Lele							

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Sr.No	Agenda	Inputs from members	Decisions	Verification status		
				A	AMC	NA
1	**Overall schemes of the program**					
a	Credits	Verified for different subject	Found satisfactory.		✓	
b	Flow	Changes specified for few subjects	change was approved.		✓	
c	Contact hours	Verified	Found ok		✓	
2	**Semester wise curriculum structure**					
a	Credits	Verified	Found ok., satisfactory		✓	
b	Flow	Minor changes incorporated.	Found ok. accepted		✓	
c	Contact hours	Verified	Found Ok., accepted		✓	
d	Evaluation scheme	Verified	Accepted.		✓	
3	**Course contents**					
a	Subject contents	Suggested changes	Approved with incorporated changes		✓	
b	Unitization	Verified	Found Ok.		✓	
c	Reference books	Verified for specific subjects	Approved. with changes.		✓	
d	Evaluation method	Verified	Found satisfactory		✓	

Verified by(Use Initials)	DR. Dhanesh Manik	Mr. Abhijit Lele	Mr. Sachinkumar	Supreet Kamatagi	A.C.Giriyapur	Jyoti Bali	Vinod Meti	Nagaraj MB	Sachin Karadgi
Signature	Dhanesh Manik	A.M.lele		Skamatagi		J S Bali			Sachin K

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Title: Verification-Curriculum Design and Development 2017- 21 Batch			Page : of 1 Year:2019

Sr.No	Agenda	Inputs from members	Decisions	Verification status		
				A	AMC	NA
1	**Overall schemes of the program**					
a	Credits	Suggested changes, incorporated	Found satisfactory		✓	
b	Flow	Minor changes incorporated	Accepted.		✓	
c	Contact hours	Verified	Found Ok, Accepted.		✓	
2	**Semester wise curriculum structure**					
a	Credits	Minor changes incorporated	Found satisfactory.		✓	
b	Flow	Verified & suggested few changes.	Accepted		✓.	
c	Contact hours	Verified	Found Ok Accepted.		✓	
d	Evaluation scheme	Verified	Found Ok. Accepted		✓	
3	**Course contents**					
a	Subject contents	Verified few changes suggested	Found Ok		✓	
b	Unitization	Verified and	Accepted.		✓	
c	Reference books	Added few text books	Accepted		✓	
d	Evaluation method	Verified	found Ok.		✓	

Verified by(Use Initials)	DR. Dhanesh Manik	Mr. Abhijit Lele	Mr. Sachinkumar	Supreet Kamatagi	A.C.Giriyapur	Jyoti Bali	Vinod Meti	Nagaraj MB	Sachin Karadgi
Signature	Dhanesh Mani	A.M.lele							

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Sr.No	Agenda	Inputs from members	Decisions	Verification status		
				A	AMC	NA
1	**Overall schemes of the program**					
a	Credits	Suggested changes in some subjects	Verified & Accepted.		✓	
b	Flow	Verified for few core subjects	Found Ok Accepted		✓	
c	Contact hours	Verified for few subjects	Accepted.		✓	
2	**Semester wise curriculum structure**					
a	Credits	Verified	Found Ok. Satisfactory		✓	
b	Flow	Minor changes suggested	Found Ok. Accepted		✓	
c	Contact hours	Verified	Accepted		✓	
d	Evaluation scheme	Verified	Accepted with minor changes		✓	
3	**Course contents**					
a	Subject contents	Verified for some subjects	Accepted with incorporated changes		✓	
b	Unitization	Verified	Found Ok.		✓	
c	Reference books	Verified for specific subjects	Approved with changes		✓	
d	Evaluation method	Verified	Found satisfactory		✓	

Verified by(Use Initials)	DR. Dhanesh Manik	Mr. Abhijit Lele	Mr. Sachinkumar	Supreet Kamatagi	A.C.Giriyapur	Jyoti Bali	Vinod Meti	Nagaraj MB	Sachin Karadgi
Signature	Dhanesh Manik	A.M.Lele		Kamatagi		JSBali			Sachin K

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Semester: VII (2016-20 batch) Date of Review: 13-04-2019

Inputs for review: PEO- Mapping of CLO with PO – Academic Guidelines-Previous review outcomes

Sr.No	Features reviewed	Status of Review		
		Accepted	Accepted with minor changes	Not accepted
01	**Overall schemes of the program**			
a	Credits		✓	
b	Flow		✓	
c	Contact hours		✓	
02	**Semester wise curriculum structure**			
a	Credits		✓	
b	Flow		✓	
c	Contact hours		✓	
d	Evaluation scheme	✓		
03	**Course contents**			
a	Subject contents		✓	
b	Unitization		✓	
c	Reference books		✓	
d	Evaluation method		✓	

Changes Suggested (Serial number wise)	
1.	Syllabus content of IDN, Advanced MCU & CIM, Measurement s/ms. verified after changes.
2.	Added Reference books for some subjects like Measurement s/m.
3.	Review of elective subjects done and suggested modifications

Reviewed by (Use initials)	DR. Dhanesh Manik	Mr. Abhijit Lele	Mr. Sachinkumar	Supreet Kamatagi	A.C.Giriyapur	Jyoti Bali	Vinod Meti	Nagaraj MB	Sachin Karadgi
Signature	Dhanesh Manik	AM. Lele							

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			Year:

Semester: VIII (2016-20 batch)

Date of Review: 13-04-2019

Inputs for review: PEO- Mapping of CLO with PO – Academic Guidelines-Previous review outcomes

Sr.No	Features reviewed	Status of Review		
		Accepted	Accepted with minor changes	Not accepted
01	**Overall schemes of the program**			
a	Credits		✓	
b	Flow		✓	
c	Contact hours		✓	
02	**Semester wise curriculum structure**			
a	Credits		✓	
b	Flow		✓	
c	Contact hours		✓	
d	Evaluation scheme	✓		
03	**Course contents**			
a	Subject contents		✓	
b	Unitization		✓	
c	Reference books		✓	
d	Evaluation method		✓	

Changes Suggested (Serial number wise)	
1)	Verified syllabus of Computer Integrated Manufacturing and suggested changes
2)	Verified the prescribed books for each of the subject and added few books.

Reviewed by (Use initials)	DR. Dhanesh Manik	Mr. Abhijit Lele	Mr. Sachinkumar	Supreet Kamatagi	A.C.Giriyapur	Jyoti Bali	Vinod Meti	Nagaraj MB	Sachin Karadgi
Signature		A.M.Lele							

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Semester: V (2017-21 batch) Date of Review: 13-04-2019

Inputs for review: PEO- Mapping of CLO with PO – Academic Guidelines-Previous review outcomes

Sr.No	Features reviewed	Status of Review		
		Accepted	Accepted with minor changes	Not accepted
01	**Overall schemes of the program**			
a	Credits		✓	
b	Flow		✓	
c	Contact hours		✓	
02	**Semester wise curriculum structure**			
a	Credits		✓	
b	Flow		✓	
c	Contact hours		✓	
d	Evaluation scheme	✓		
03	**Course contents**			
a	Subject contents		✓	
b	Unitization		✓	
c	Reference books		✓	
d	Evaluation method	✓		

Changes Suggested (Serial number wise)	
1.	Changes spcified in Robot analysis & Design, PIAS MSD.
2.	Changes in the delivery of Robotics lab. suggested
3.	Changes proposed in Measurements / Mechatronics Lab accepted.

Reviewed by (Use initials)	DR. Dhanesh Manik	Mr. Abhijit Lele	Mr. Sachinkumar	Supreet Kamatagi	A.C.Giriyapur	Jyoti Bali	Vinod Meti	Nagaraj MB	Sachin Karadgi
Signature	Dhanesh Mai	A.M.lele							

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Semester: VI (2017-21 batch) Date of Review: 13-04-2019

Inputs for review: PEO- Mapping of CLO with PO – Academic Guidelines-Previous review outcomes

Sr.No	Features reviewed	Status of Review		
		Accepted	Accepted with minor changes	Not accepted
01	**Overall schemes of the program**			
a	Credits		✓	
b	Flow		✓	
c	Contact hours		✓	
02	**Semester wise curriculum structure**			
a	Credits		✓	
b	Flow		✓	
c	Contact hours		✓	
d	Evaluation scheme	✓		
03	**Course contents**			
a	Subject contents		✓	
b	Unitization		✓	
c	Reference books		✓	
d	Evaluation method	✓		

Changes Suggested (Serial number wise)	
1)	Changes proposed in course content of Artificial intelligence and Machine learning
2)	Suggested to change the course as two different subjects to justify the content prescribed one as Core course and other as Elective

Reviewed by (Use initials)	DR. Dhanesh Manik	Mr. Abhijit Lele	Mr. Sachinkumar	Supreet Kamatagi	A.C.Giriyapur	Jyoti Bali	Vinod Meti	Nagaraj MB	Sachin Karadgi
Signature	Dhanesh Manik	A.M.Lele		Kamatagi		JS Bali	Vinod	NMB	Sachin

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Semester: III (2018-22 batch)

Date of Review:13-04-2019

Inputs for review: PEO- Mapping of CLO with PO – Academic Guidelines-Previous review outcomes

Sr.No	Features reviewed	Status of Review		
		Accepted	Accepted with minor changes	Not accepted
01	**Overall schemes of the program**			
a	Credits		✓	
b	Flow		✓	
c	Contact hours		✓	
02	**Semester wise curriculum structure**			
a	Credits		✓	
b	Flow		✓	
c	Contact hours		✓	
d	Evaluation scheme	✓		
03	**Course contents**			
a	Subject contents		✓	
b	Unitization		✓	
c	Reference books		✓	
d	Evaluation method	✓		

Changes Suggested (Serial number wise)	
1.	Propond to combine Machine IWG & Manufacturing Lab
2.	Reviewed the course content of Microcontrollers and propond changes
3.	Reviewed the course syllabus of Kinematics & Dynamics of Machinery & approved.
4.	changes in the delivery of RTES approved.

Reviewed by (Use initials)	DR. Dhanesh Manik	Mr. Abhijit Lele	Mr. Sachinkumar	Supreet Kamatagi	A.C.Giriyapur	Jyoti Bali	Vinod Meti	Nagaraj MB	Sachin Karadgi
Signature	Dhanesh Manik	A.M.Lele							

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Semester: IV (2018-22 batch)

Date of Review:13-04-2019

Inputs for review: PEO- Mapping of CLO with PO – Academic Guidelines-Previous review outcomes

Sr.No	Features reviewed	Status of Review		
		Accepted	Accepted with minor changes	Not accepted
01	**Overall schemes of the program**			
a	Credits		✓	
b	Flow		✓	
c	Contact hours		✓	
02	**Semester wise curriculum structure**			
a	Credits		✓	
b	Flow		✓	
c	Contact hours		✓	
d	Evaluation scheme	✓		
03	**Course contents**			
a	Subject contents		✓	
b	Unitization		✓	
c	Reference books		✓	
d	Evaluation method	✓		

Changes Suggested (Serial number wise)	
1.	Reviewed the course content of Microcontrollers and Real time Embedded Systems.
2.	Emphasis on case study discussion was stressed by external members.

Reviewed by (Use initials)	DR. Dhanesh Manik	Mr. Abhijit Lele	Mr. Sachinkumar	Supreet Kamatagi	A.C.Giriyapur	Jyoti Bali	Vinod Meti	Nagaraj MB	Sachin Karadgi
Signature	Dhanesh Manik	A.M.Lele							

KLE Technological University
Creating Value Leveraging Knowledge

DEPARTMENT OF AUTOMATION AND ROBOTICS

Course Content

Course Code: 18EARC203	Course Title: **Data structures ,Algorithm design and analysis**	
L-T-P : 4-1-0	Credits: 4	Contact Hrs: 50
ISA Marks: 50	ESA Marks: 50	Total Marks: 100
Teaching Hrs: 50		Exam Duration: 03 hours

Content	Hrs
Unit - 1	
Chapter 1: GENERAL PROBLEM SOLVING CONCEPTS- Problem Solving in Everyday Life, Types of Problems, Problem Solving with Computers - Problem Definition, Solution Design & Refinement, Testing Strategy Development, Program Coding and Testing, Using the Problem Solving Method, Break-Out Diagrams, Difficulties with Problem Solving. How the Computer Stores Data, Functions-function prototypes, Operators, Expressions and Equations.	6 hrs
Chapter 2: DESIGN AND ANALYSIS OF ALGORITHMS-Algorithms and Their Representations, Modifying Algorithms, Review of Asymptotic Notations, Mathematical Analysis of Non-Recursive and Recursive Algorithms, Brute Force Approaches: Introduction, Selection Sort and Bubble Sort, Sequential Search and Brute Force String Matching , Divide and Conquer: General Method, Defective Chess Board, Binary Search, Merge Sort, Quick Sort and its performance.	7 hrs
Chapter 3: ARRAYS, STACKS & QUEUES: Arrays, Dynamically Allocated Arrays, , Polynomials, Sparse Matrices, Representation of Multidimensional Arrays, Structures and Unions, Stacks, Stacks Using Dynamic Arrays, Queues, Circular Queues, Evaluation of Expressions, Queues, Single- and Double-Ended Priority Queues.	7 hrs
Unit - 2	
Chapter 4: LINKED LISTS, TREES &GRAPHS: Singly Linked lists and Chains, Representing Chains in C, Linked Stacks and Queues, Polynomials, Additional List operations, Sparse Matrices, Doubly Linked Lists. Introduction, Binary Trees, Binary Tree Traversals, Graph representation, Adjacency matrix, Adjancey list, Application of graphs.	8 hrs
Chapter 5:DYNAMIC PROGRAMMING & GREEDY METHOD: Depth First Search and Breadth First Search, The General Method, Warshall's Algorithm,	7 hrs

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Floyd's Algorithm for the All-Pairs Shortest Paths Problem, Single-Source Shortest Paths, The Traveling Salesperson problem, Kruskal's algorithm, Huffman trees.	
Unit - 3	
Chapter 6: INTRODUCTION TO C++: Overview of C++, Sample C++ program, Different data types, operators, expressions, and statements, arrays and strings, pointers & user defined types. Class Specification, Class Objects, Scope resolution operator, Access members, Defining member functions, Data hiding, Constructors, Destructors, Parameterized constructors,	8 hrs
Chapter 7:BASIC OOP CONCEPTS: Base Class, Inheritance and protected members, Protected base class inheritance, Inheriting multiple base classes, Virtual function, Calling a Virtual function through a base class reference, Virtual attribute is inherited, and Virtual functions are hierarchical, Pure virtual functions, Abstract classes, Using virtual functions.	7 hrs

Text Books (List of books as mentioned in the approved syllabus)

1. Maureen Sprankle, Jim Hubbard: "PROBLEM SOLVING & PROGRAMMING CONCEPTS", Pearson Publications, 9th edition, 2012.
2. AnanyLevitin: Introduction to The Design & Analysis of Algorithms, 2nd Edition, Pearson Education, 2007.
3. Horowitz, Sahni, Anderson-Freed: Fundamentals of Data Structures in C, 2nd Edition, Universities Press, 2007.
4. Herbert Schildt: The Complete Reference C++, 4th Edition, Tata McGraw Hill, 2003.

References

1. Yedidyah, Rubenstein, Tannenbaum: Data Structures Using C and C++, 2nd Edition, Pearson Education, 2003.
2. Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Cliffor Stein: Introduction to Algorithms, 3rd Edition, PHI, 2010.

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HUBBALLI-31.

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