KLE Society's

KLE Technological University

SCHOOL OF COMPUTER SCIENCE AND ENGINEERING

Course Content

Course Code: 17ECSC701	Course Title: Data Structures and Algorithms	
L-T-P: 3-0-0	Credits: 3	Contact Hrs: 42
CIA Marks: 50	SEE Marks: 50	Total Marks: 100
Teaching Hrs: 42		Exam Duration: 3 hrs

Content	Hrs
Chapter No. 1. Introduction. Performance Analysis of Algorithms, Asymptotic Notations, Performance Measurement and Solving recurrence equations.	6 hrs
Chapter No. 2. Skip lists, Hashing, and Priority Queues Dictionaries, Skip lists Representation, Hash table representation and application (Text Compression), Definition of Priority Queues, Heaps, Leftist trees and applications.	8 hrs
Chapter No. 3 Balanced Search Trees: AVL, Red Black, B-Trees, Alternative decision tree, Radix trees and applications.	8 hrs
Chapter No. 4. Greedy Method and Divide and Conquer: Greedy Method and Divide and Conquer: Greedy method and applications (Task Scheduling). Divide and Conquer method and applications (maxima-Set Problem).	8 hrs
Chapter No. 5. Dynamic Programming: General Technique, Game Strategies and Longest Common Subsequence Problem(LCS)	6 hrs
Chapter No. 6. Backtracking and Branch & Bound: Backtracking Method, Branch and Bound method and application: CNF-SAT problem	6 hrs

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

1. Sartaj Sahni, Data Structures, Algorithms and applications in C++, 2, Universities Press, 2008
2. Horowitz, Sahni, Rajasekaran, , Fundamentals of Computer Algorithms, 1, Galgotia Publications, 2010

References

1. Mark Allen Weiss, Data Structures and Algorithm Analysis in C, 2, Pearson Education, 2003
2. Aron M. Tenenbaum, Data Structures using C, 2, PHI, 2006
3. Michael T. Goodrich, Roberto Tamassia, Algorithm Design and Applications, Wiley Publications, 2015

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B V Bhoomaraddi College of
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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			A	
2	**Problem analysis:**				
	Ability to identify, characterize and formulate a solution plan for solving engineering problems				A
	Ability to execute a solution process and analyse results				A
3	**Design/Development of Solutions:**				
	Ability to design components, systems or processes that meet specified needs, following appropriate engineering design process				A
4	**Conduct investigations of complex problems:**				
	Ability to conduct investigations or tests through design of experiments to understand and solve engineering problems				A
	Ability to critically analyse and interpret data to reach valid conclusions				A
5	**Modern tool usage:**				
	Ability to identify / create and use appropriate modern engineering and IT tools, techniques and resources to solve engineering problems				A

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B.V. Bhoomaraddi College of
Engineering & Technology, Hubli

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 ☑ A

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

Poor ☐ OK ☐ Good ☐ Very Good ☑ A

Name: Pratiksha. Benagi	Branch: SoCSE
e-mail id: pratiksha6656@gmail.com	Batch: 2015-2017
Name of the company: KLE Technological University Hubballi	
Correspondence Address: "Samruddhi" Dareshwari Nagar Vidyagiri Dharwad.	
Signature:	

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Dear proud alumni ,

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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				A
2	**Problem analysis:**				
	Ability to identify, characterize and formulate a solution plan for solving engineering problems			A	
	Ability to execute a solution process and analyse results			A	
3	**Design/Development of Solutions:**				
	Ability to design components, systems or processes that meet specified needs, following appropriate engineering design process				A
4	**Conduct investigations of complex problems:**				
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	Demonstrate an understanding of professional engineering regulations, legislation and standards				A
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	An ability to apply design and development principles in the construction of software systems of varying complexity.				A

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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: Shashidhara. B. Vyakaranal	Branch: SoCSE
e-mail id: shashidhara1994@gmail.com	Batch: 2016-18
Name of the company: KLE Technological University	
Correspondence Address: 335/B "Shri sargan" Friends Colony Bharathi Nagar Kelageri Road Dharwad - 580001	
Signature:	

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	Ability to identify, characterize and formulate a solution plan for solving engineering problems				A
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3	**Design/Development of Solutions:**				
	Ability to design components, systems or processes that meet specified needs, following appropriate engineering design process			A	
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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: Shivaraj. Kengund	Branch: Computer Science
e-mail id: shivaraj.kengund@gmail.com	Batch: 2016-18
Name of the company: KLE Technological University - Hubballi	
Correspondence Address: #138, Factory, Kulnur Cross Post: Sangur. Tq: D: Haveri - 581148	
Signature:	

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

Poor ☐ OK ☐ Good ☐ Very Good ☑

Name: Shreedevi V. Sindagi	Branch: SoCSE
e-mail id: Shreedevisindagi6@gmail.com	Batch: 2016-18
Name of the company: Continental Bangalore	
Correspondence Address: V.D. Sindagi Ganesh Nilaya HNO 2756/a71 OPP: Aktaeti Oil Mill Hudal layout Bandal Cross Sindagi, Vijayapur	
Signature:	

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	Ability to apply the knowledge of mathematics, science, engineering fundamentals, and engineering specialization for the solution of engineering problems			A	
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	Ability to execute a solution process and analyse results				A
3	**Design/Development of Solutions:**				
	Ability to design components, systems or processes that meet specified needs, following appropriate engineering design process			A	
4	**Conduct investigations of complex problems:**				
	Ability to conduct investigations or tests through design of experiments to understand and solve engineering problems			A	
	Ability to critically analyse and interpret data to reach valid conclusions				A
5	**Modern tool usage:**				
	Ability to identify / create and use appropriate modern engineering and IT tools, techniques and resources to solve engineering problems				A

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6	**The engineer and society:**				
	Demonstrate an understanding of professional engineering regulations, legislation and standards				4
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			4	
8	**Ethics:**				
	Ability to apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice				4
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				4
10	**Communication:**				
	Ability to comprehend technical literature and prepare effective reports and design documents				4
	Demonstrate competence in listening, speaking, and presentation				4
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			4	
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			4	
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.				4
14	**Construction of software system**				
	An ability to apply design and development principles in the construction of software systems of varying complexity.				4

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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 ☒A

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

Poor ☐ OK ☐ Good ☐ Very Good ☒A

Name: Supritha patil	Branch: SOCSE
e-mail id: supritapatil14@gmail.com.	Batch: 2015 – 2017
Name of the company: Emertex	
Correspondence Address: 1st CROSS, near NTTF Dharwad.	
Signature: Suprtha.	

Annexure VIII (c) - Course Feedback

KLE Technological University

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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 SOCSE Name of the Teacher Prof. Jayalaxmi GN.

Course Title Data Structures & Algorithms Course code: (17ECSC701) Semester 1

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% ☐

Signature

Date: 19/2/2018

Harshata C 368
Shiralkar

Annexure VIII (c) - Course Feedback

KLE Technological University

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: ECSE Name of the Teacher: Vidya Jayadevappa D.H.

Course Title: Data Structures & Algorithms Course Code: 21ECE33 Semester: 3

a. The design of the course	Strongly agree	Agree	Uncertain	Disagree	Strongly Disagree
The course objectives were clear		✓			
The course contents met with your expectations	✓				
The course work load was manageable		✓			
The lecture sessions were 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 IA assessment was timely	✓				
Feedback on IA 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: 19/9/2018

Signature of Teacher

Vidya D Jayadevappa

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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 Prof. Jayalaxmi G.N

Department/School SoCSE Name of the Teacher Prof. Jayalaxmi. G N.

Course Title Data Structures & Algorithms Course code: (17ECSC701) Semester 1

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	✓				
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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% [ ]

Amit
Signature

Date: 19/1/2018

Amit M Potdar

KLE Technological University

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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.

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Department/School SOCSE Name of the Teacher Prof. Jayalaxmi G N.

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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% ☐

Signature

Date: 14/2/2019

Shobha C Hiremath

Annexure VIII (c) - Course Feedback

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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 SOCSE Name of the Teacher Prof. Jayalaxmi. G N.

Course Title Data Structures & Algorithms Course code: (17ECSC701) Semester 7

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% ☐

Signature

Date: 19/2/2018

vpbaligar . <vpbaligar@kletech.ac.in> Sat, Dec 14, 2019, 11:26 AM

to apoorva.ankad

Dear Sri Apoorva,

I hope our students are doing well at Deevia.

We the students and faculty of K L E Technological University feel happy to coordinate and collaborate with Deevia Software.

Now it is the time to have your input for MTech Computer Science and Engineering from the point of Deevia Software and also general input. What all the subjects / Projects / Industrial Training to include in the curriculum. Your inputs are very valuable for us so that we try to include the suggestions given by you in the curriculum.

Kindly acknowledge receipt of this mail.

Thanking you

Regards

vpbali gar . Sat, Dec 14, 2019, 11:27 AM

Sir, For your kind perusal. Regards

vpbali gar . Tue, Dec 17, 2019, 10:22 AM

---------- Forwarded message ---------- From: "vpbaligar ." <vpbaligar@kletech.ac.in> Date: Sat, 14 Dec
Subject: Thank you and request to gi

Apoorva Ankad <apoorva.ankad@deevia.pw> Wed, Dec 18, 2019, 11:17 AM

to me

Dear Baligar Sir,

My apologies for the late reply.

Your students at Deevia are doing great !!! We are really happy about that.
Regarding the curriculum, we feel a right mix of basic courses + specialization programs would be great.

For example,
* Student mandatorily studies a comparative study of Programing language types (Ex: Procedural, Functional, Object-oriented, Scripting, etc.) with real time usage examples.
* Use-case based course on design patterns would be great as a mandatory course.
* A student with AI major, studies ML and DL as basic courses (With one specialization course like Computer Vision or NLP or Reinforcement Learning, etc.)
Again these courses would be better if they are case-study based.
* Projects should be an extension of the specialization (Computer Vision, NLP, Reinforcement Learning, etc.).

We would be happy to assist you with tuning the syllabus and projects in the space of AI.

Thanks and Best Regards,

Apoorva Ankad

DEEVIA Software India Pvt Ltd

#921, Lakshmi Towers, 2nd Floor

5th Main, Sector 7, HSR Layout

Bangalore – 560102, Karnataka, India

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KLE Technological University
SCHOOL OF COMPUTER SCIENCE & ENGINEERING

Teachers Feedback

Semester: I
Course: Data structures and Algorithms

Course: PG
Course Code: 17ECSC701

Year	Feedback	Name of course instructor
2017-18	Based teaching experience with PG students and industry feed back, I suggest to introduce Data structures and algorithms as a laboratory course and Design and analysis of Algorithms as theory course in the first year of PG program for the following reasons: • To give more focus on coding and problem solving skill. • Reinforce basic data structure concepts. • Enhance the concepts of variant advance data structures • Design and develop real world applications using algorithm design techniques. • Explore practical experience in data structures and algorithm courses.	Dr. Jayalaxmi G Naragund

Signature Course faculty:

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SCHOOL OF COMPUTER SCIENCE & ENGINEERING

Teachers Feedback

Semester: II
Course: **Data Structures and Algorithms**

Course: PG
Course Code: 17ECSC701

Year	Feedback	Name of course instructor
2017-18	Based on the placement feedback and teaching experience in this course. I suggest to introduce Data structures as a lab course and Design and analysis of Algorithms as theory course in the first year of PG program for the following reasons: • Explore the PG students to select appropriate data structure and algorithms to solve real world problem • Illustrate the usage of advance data structure in daily life activities, like google search engine. • Separate focus is required for algorithm design and data structures.	Prof. Priyadarshini Kalawad

Signature Course faculty:

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SCHOOL OF COMPUTER SCIENCE & ENGINEERING

Teachers Feedback

Semester: II
Course: **Data Structures and Algorithms**

Course: PG
Course Code: 17ECSC701

Year	Feedback	Name of course instructor
2017-18	Based on the placement feedback and teaching experience in this course. I suggest to introduce Data structures as a lab course and Design and analysis of Algorithms as theory course in the first year of PG program for the following reasons: • To solve many complex real world problems, the ability to formulate an efficient algorithm depends on being able to organize the data in an appropriate manner. • The choice of data structures affects the efficiency of the algorithms. Therefore in depth knowledge of data structures addressing real world scenarios is very essential. • Hence the courses can be taught as two different courses with rigor.	Vidya S.Handur

Signature Course faculty:

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SCHOOL OF COMPUTER SCIENCE & ENGINEERING

Teachers Feedback

Semester: IICourse: PG

Course: **Datastructures and Algorithms** Course Code: 17ECSC701

Year	Feedback	Name of course instructor
2017-18	Based on the teaching experience, I strongly recommend Design and Analysis of Algorithm to be taught to PG Students. There is scope to modify the scheme in which we can Data Structures and Algorithms can be made as a lab and Design and Analysis as a theory course for the following reasons: • Design and Analysis is more important at P G level • The students should be able to design efficient algorithms for many applications including their project work • There is a lot of scope for efficient algorithms in many fields.	Dr. V P Baligar

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Teachers Feedback

Semester: I
Course: Data structures and Algorithms

Course: PG
Course Code: 17ECSC701

Year	Feedback	Name of course instructor
2017-18	Based on the placement feedback and teaching experience in this course. I suggest to introduce Data structures as a lab course and Design and analysis of Algorithms as theory course in the first year of PG program for the following reasons: • To enhance the learning and provide more hands-on experience in the DS course. • To acquire the knowledge of advanced algorithms. • Also the usage of code challenging platforms in the course delivery can enhance the problem solving and coding skills.	Prof. Sujatha C

Signature Course faculty:

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Minutes

4th Board of Studies Meeting

of

School of Computer Science and Engineering

Hubballi, Karnataka

7th April 2018

KLE Technological University

(Established under Karnataka Act No.22, 2013)

REGISTRAR
KLE Technological University
HUBBALLI-580 031

School of Computer Science and Engineering
KLE Tech University
BVBCET Campus, Hubballi –31

The following are the minutes of the Board of Studies meeting of SoCSE, KLE Technological University, Hubballi which was held on 7th April 2018 at 09:00 am at the C-lite Board Room.

The following members were present.

Sr	Name	Designation	Position
1.	Dr. Meena S. M.	Professor & Head of the School	Chairman
2.	Dr. G. H. Joshi	Professor, Dean's nominee	Member
3.	Dr. V. P. Baligar	Professor, Dean's nominee	Member
4.	Dr. S.R. Chickerur	Professor, Dean's nominee	Member
5.	Dr. S.G. Totad	Professor, Dean's nominee	Member
6.	Dr. Karibasappa K.G.	Professor, Dean's nominee	Member
7.	Prof. Narayan D. G.	Associate Professor, Dean's nominee	Member
8.	Prof. Vidya Handur	Associate Professor, Dean's nominee	Member
9.	Prof. Prakash Hegde	Assistant Professor nominated by the concerned Head of the Department/ School	Member
10.	Prof. Phalachandra HL	Subject expert from outside the college nominated by the Vice-Chancellor	Member
11.	Mr. Ram Jakati	Representative from industry corporate sector/ allied area relating to placement nominated by the Vice-Chancellor	Member
12.	Mr. Shashikumar G.	Representative from industry corporate sector/ allied area relating to placement nominated by the Vice-Chancellor	Member
13.	Mr. Santosh Pawar	Representative from industry corporate sector/ allied area relating to placement nominated by the Vice-Chancellor	Member
14.	Prof. Shankar G.	Associate Professor Dean's nominee	Member Secretary

Agenda

Sl No	Particulars	Page No.
4.1	To welcome the BoS Members and present department achievements & initiatives	
4.2	To read and confirm the minutes of 3rd BoS meeting held on 1st April 2017	
4.3	To confirm the action taken report on the minutes of the previous meeting held on 1st April 2017	
4.4	To consider the Schemes and Syllabi of the undergraduate program B.E in Computer Science and approve the same. a. Approval of syllabi VII & VIII Semester of 2015 - 19 batch. b. Ratification of scheme for 2016 - 20, 2017 - 21 batch. c. Approval of syllabi V & VI Semester of 2016 - 20 batch. d. Approval of syllabi III & IV Semester of 2017 - 21 batch. e. Approval of syllabus I/II Semester of 2018 - 22 batch. f. Approval of scheme III to VIII Semester of 2018 - 22 batch. g. Minor Programme in CSE for 2019 -21 batch.	
4.5	To consider the Schemes and Syllabi of the postgraduate program in CSE. a) Approval of (scheme & syllabi) of 2018 - 20 batch.	
4.6	Any other matter for discussion with the permission of the chair	

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School of Computer Science and Engineering
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BoS 4.1	**To welcome the BoS Members and present department achievements & initiatives and discussed about the inputs from all stake holders.** ***(Annexure 4.1)***

Resolution 4.1: The BoS members appreciated the initiatives of SoCSE and lauded its achievements.

BoS 4.2	**To read and confirm the minutes of 3rd BoS meeting held on 1st April 2017**

The following are the minutes of the Board of Studies meeting of SoCSE, KLE Technological University, Hubballi which was held on 1st April 2017 at 09:00 am at the C-lite Board Room.

The following members were present.

Sl No	Name	Designation	Position
1.	Dr. Meena S. M.	Professor & Head of the School/ Department	Chairman
2.	Dr. G. H. Joshi	Professor , Dean's nominee	Member
3.	Dr. V. P. Baligar	Professor Dean's nominee	Member
4.	Dr. S.R. Chickerur	Professor Dean's nominee	Member
5.	Dr. S.G. Totad	Professor Dean's nominee	Member
6.	Dr. Karibasappa K.G.	Professor Dean's nominee	Member
7.	Dr. Narayan D. G.	Associate Professor Dean's nominee	Member
8.	Prof. Vidya Handur	Associate Professor Dean's nominee	Member
9.	Dr. Basavaraj Anami	Subject expert from outside the college nominated by the Vice-Chancellor	Member
10.	Prof. Muralidhar V.N.	Subject expert from outside the college nominated by the Vice-Chancellor	Member
11.	Dr. Pradeep V. Desai	Representative from industry corporate sector/ allied area relating to placement nominated by the Vice-Chancellor	Member
12.	Mr. Shashikumar G.	Representative from industry corporate sector/ allied area relating to placement nominated by the Vice-Chancellor	Member
13.	Mr. Ram Jakati	Representative from industry corporate sector/ allied area relating to placement nominated by the Vice-Chancellor	Member
14.	Prof. Phalachandra HL	Subject expert from outside the college nominated by the Vice-Chancellor	Member
15.	Dr. Shankar G.	Associate Professor Dean's nominee	Member Secretary

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KLE Tech. CREATING VALUE LEVERAGING KNOWLEDGE

School of Computer Science and Engineering
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BVBCET Campus, Hubballi –31

Item No.	Description
BoS 3.1	**To welcome the BoS Members and present department achievements & initiatives and discussed about the inputs from all stake holders.** ***(Annexure 3.1)*** **Resolution 3.1:** The BoS members appreciated the initiatives of SoCSE and lauded its achievements.
BoS 3.2	**To read and confirm the minutes of 2nd BoS meeting held on 18th March 2016** **Resolution 3.2:** Resolved to confirm the minutes of its 2nd BoS meeting held on 18th March 2016
BoS 3.3	**To confirm the action taken report on the minutes of the previous meeting held on 18th March 2016** **Resolution: 3.3** Resolved to confirm the action taken report on the minutes of its 2nd BoS meeting held on 18th March 2016. The BoS members appreciated the new initiatives taken by SoCSE.
BoS 3.4	To consider the Schemes and Syllabi of the undergraduate program B.E in Computer Science and approve the same. a. Ratification of scheme for 2015-19, 2016-20 batch. b. Approval of syllabi V & VI Semester of 2015 - 19 batch. c. Approval of syllabi III & IV Semester of 2016 - 20 batch. d. Approval of scheme III to VIII Semester of 2017 - 21 batch. e. Approval of Programming in C syllabus I/II Semester of 2017 - 21 batch. f. Minor Programme in CSE
	Discussion: Based on the discussions following action, items as agreed upon by everyone were finalized and the same were circulated to all the members on 02nd April 2016. Persons responsible for these action items have already initiated the actions, which will be shared the next BoS meeting. The details of discussion are in ***Annexure 3.4***. ***Action Item No.1:*** To enhance programming skills for solving real time applications. 1) Scripting Languages Lab - 18ECSP201 ***Action Item No.2:*** To introduce students to basic building blocks of computer architecture. 1) Computer Organization and Architecture - 18ECSC201- (4-0-0) ***Action Item No.3:*** Object oriented design concepts for programming 1) Object Oriented Programming with C++ - 18ECSC207-(3-0-0) 2) Object Oriented Programming with C++ lab- 18ECSP203 - (0-0-1.5) ***Action Item No.4:*** The Operating system concepts to be simulated in lab using Unix programming. 1) Operating System Principles and Programming - 18ECSC202 (4-0-1) ***Action Item No.5:*** A course on dedicated embedded system for real time applications to be introduced to enhance employment opportunities to the current automotive industries. 1) Microcontroller Programming & Interfacing (18ECSC206) - (3-0-1) ***Action Item No.6:*** To enhance interdisciplinary project work and expose students to engineering design principles in the project space. 1) Engineering Design (17ECSP202) 2) Product Realization(17ECSP203) ***Action Item No.7:*** Increase the numbers of Industry collaborative projects for students to get exposure to industry practices. 1) Mini , Minor and capstone projects ***Action Item No.8:*** To use Hadoop framework and R / Python programming for implementing Data mining functionalities 1) Data Mining & Analysis ***Action Item No.9:*** In project work, design and documentation of the Agile software development of the software/product developed is performed. 1) Mini project

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	Resolution 3.4: Resolved to approve the Schemes and Syllabi of the undergraduate program B.E in Computer Science and approve the same. a. Approval of syllabi V & VI Semester of 2015 - 19 batch. b. Approval of syllabi III & IV Semester of 2016 - 20 batch. c. Approval of scheme III to VIII Semester of 2017 - 21 batch. d. Approval of Programming in C syllabus I/II Semester of 2017 - 21 batch. e. Minor Programme in CSE
BoS 3.5	To consider the Schemes and Syllabi of the postgraduate program. a) Approval of scheme of 2017 - 19 batch. b) Approval of syllabi of 2017 - 19 batch.
	Discussion: Based on the discussions following action, items as agreed upon by everyone were finalized and the same were circulated to all the members on 02nd April 2016. Persons responsible for these action items have already initiated the actions, which will be shared the next BoS meeting. ***Action Item No.1: New Courses added*** **Resolution 3.5: Resolved to approve the** Schemes and Syllabi of the postgraduate program. a) Approval of scheme of 2017 - 19 batch. b) Approval of syllabi of 2017 - 19 batch.
BoS 3.6	Any other subject with the permission of the Chair Nil.

Resolution 4.2: Resolved to confirm the minutes of its 2nd BoS meeting held on 18th March 2016

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BoS 4.3	To confirm the action taken report on the minutes of the previous meeting held on 1st April 2017	
Item No	**Description**	**Action Taken**
BoS 3.1	**To welcome the BoS Members and present department achievements & initiatives and discussed about the inputs from all stake holders. *(Annexure 3.1)*** **Resolution 3.1:** The BoS members appreciated the initiatives of SoCSE and lauded its achievements.	Noted
BoS 3.2	**To read and confirm the minutes of 2nd BoS meeting held on 18th March 2016** **Resolution 3.2:** Resolved to confirm the minutes of its 2nd BoS meeting held on 18th March 2016	Noted
BoS 3.3	**To confirm the action taken report on the minutes of the previous meeting held on 18th March 2016** **Resolution: 3.3** Resolved to confirm the action taken report on the minutes of its 2nd BoS meeting held on 18th March 2016. The BoS members appreciated the new initiatives taken by SoCSE.	Noted
BoS 3.4	To consider the Schemes and Syllabi of the undergraduate program B.E in Computer Science and approve the same. a. Ratification of scheme for 2015-19, 2016-20 batch. b. Approval of syllabi V & VI Semester of 2015 - 19 batch. c. Approval of syllabi III & IV Semester of 2016 - 20 batch. d. Approval of scheme III to VIII Semester of 2017 - 21 batch. e. Approval of Programming in C syllabus I/II Semester of 2017 - 21 batch. f. Minor Programme in CSE **Discussion**: Based on the discussions following action, items as agreed upon by everyone were finalized and the same were circulated to all the members on 02nd April 2016. Persons responsible for these action items have already initiated the actions, which will be shared the next BoS meeting. The details of discussion are in ***Annexure 3.4***. ***Action Item No.1:*** To enhance programming skills for solving real time applications. 1) Scripting Languages Lab - 18ECSP201 ***Action Item No.2:*** To introduce students to basic building blocks of computer architecture. 1) Computer Organization and Architecture - 18ECSC201- (4-0-0) ***Action Item No.3:*** Object oriented design concepts for programming 1) Object Oriented Programming with C++ - 18ECSC207-(3-0-0) 2) Object Oriented Programming with C++ lab- 18ECSP203 - (0-0-1.5) ***Action Item No.4:*** The Operating system concepts to be simulated in lab using Unix programming. 1) Operating System Principles and Programming - 18ECSC202 (4-0-1) ***Action Item No.5:*** A course on dedicated embedded system for real time applications to be introduced to enhance employment opportunities to the current automotive industries. 1) Microcontroller Programming & Interfacing (18ECSC206) - (3-0-1) ***Action Item No.6:*** To enhance interdisciplinary project work and expose students to engineering design principles in the project space. 1) Engineering Design (17ECSP202)	**The BoS members noted the progress of the School and recommended certain action items and timeline.** ***Action Item No.1:*** To enhance programming skills for solving real time applications. ***ATR:*** It is resolved to introduce a course Scripting Languages Lab - 18ECSP201- (0-0-2) at IV semester to enhance programming skills using python and shell scripting laying the foundations to conduct projects to solve real time applications. ***Action Item No.2:*** To introduce students to basic building blocks of computer architecture. ATR: It is resolved to change the contents of Course COA to include theoretical design and functionality of different building blocks of modern computer systems. Hence change in syllabus of Computer Organization and Architecture - 18ECSC201- (4-0-0) ***Action Item No.3:*** Object oriented design concepts for programming ***ATR:*** It is resolved to introduce a Course and lab on Object Oriented Programming with C++ for enhancing programming skills. 1) Object Oriented Programming with C++ - 18ECSC207-(3-0-0) 2) Object Oriented Programming with C++ lab- 18ECSP203 - (0-0-1.5) ***Action Item No.4:*** The Operating system concepts to be simulated in lab using Unix programming. ATR: It is resolved to include a lab component for realization of OS concepts

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	2) Product Realization(17ECSP203) ***Action Item No.7:*** Increase the numbers of Industry collaborative projects for students to get exposure to industry practices. 1) Mini , Minor and capstone projects ***Action Item No.8:*** To use Hadoop framework and R / Python programming for implementing Data mining functionalities 2) Data Mining & Analysis ***Action Item No.9:*** In project work, design and documentation of the Agile software development of the software/product developed is performed. 2) Mini project	by introducing a course Operating System Principles and Programming - 18ECSC202 (4-0-1). ***Action Item No.5:*** A course on dedicated embedded system for real time applications to be introduced to enhance employment opportunities to the current automotive industries. ATR: It is resolved to introduce a new course on Microcontroller Programming & Interfacing (18ECSC206) - (3-0-1) to conduct projects on real time application such as IoT and embedded applications. ***Action Item No.6:*** To enhance interdisciplinary project work and expose students to engineering design principles in the project space. ATR: It is resolved to enhance engineering design skills for interdisciplinary project work Engineering Design (17ECSP202) Product Realization(17ECSP203) ***Action Item No.7:*** Increase the numbers of Industry collaborative projects for students to get exposure to industry practices. ATR: It is resolved that 20% of the minor and capstone projects are carried out in collaboration with industry. 1) Mini, Minor and capstone projects ***Action Item No.8:*** To use Hadoop framework and R / Python programming for implementing Data mining functionalities ATR: It is resolved to manage huge data by dividing it in clusters and managing through Hadoop echo system. To preprocess and to manage huge data using R/Python programming. 1) Data Mining & Analysis ***Action Item No.9:*** In project work, design and documentation of the Agile software development of the software/product developed is performed. ATR: It is resolved that software engineering concepts are practiced in mini projects. Mini project

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Resolution 3.4: Resolved to approve the Schemes and Syllabi of the undergraduate program B.E in Computer Science and approve the same.

a. Approval of syllabi V & VI Semester of 2015 - 19 batch.
b. Approval of syllabi III & IV Semester of 2016 - 20 batch.
c. Approval of scheme III to VIII Semester of 2017 - 21 batch.
d. Approval of Programming in C syllabus I/II Semester of 2017 - 21 batch.
e. Minor Programme in CSE

BoS 3.5	To consider the Schemes and Syllabi of the postgraduate program. a) Approval of scheme of 2017 - 19 batch. b) Approval of syllabi of 2017 - 19 batch. **Discussion**: Based on the discussions following action, items as agreed upon by everyone were finalized and the same were circulated to all the members on 02nd April 2016. Persons responsible for these action items have already initiated the actions, which will be shared the next BoS meeting. ***Action Item No.1: New Courses added*** 1.Principles and practices of Engineering Education	**The BoS members noted the progress of the School and recommended certain action items and timeline.** ***Action Item No.4: Identify industries in focus areas.*** *ATR: Discussion with industries from Infosys, KPIT, Continental, and other industries.* ***Action Item No.5: Identify industries for Internships.*** *ATR: Identified about 10 industries, and discussions are at initial stage.*

Resolution 3.5: Resolved to approve the Schemes and Syllabi of the postgraduate program.

a) Approval of scheme of 2017 - 19 batch.
b) Approval of syllabi of 2017 - 19 batch.

BoS 3.6	Any other matter for discussion with the permission of the chair NIL	

Resolution: 4.3 Resolved to confirm the action taken report on the minutes of its 3rd BoS meeting held on 1st April 2017. The BoS members appreciated the new initiatives taken by SoCSE.

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BoS 4.4	To consider the Schemes and Syllabi of the undergraduate program B.E in Computer Science and approve the same. a. Approval of syllabi VII & VIII Semester of 2015 - 19 batch. b. Ratification of scheme for 2016 - 20, 2017 - 21 batch. c. Approval of syllabi V & VI Semester of 2016 - 20 batch. d. Approval of syllabi III & IV Semester of 2017 - 21 batch. e. Approval of syllabus I/II Semester of 2018 - 22 batch. f. Approval of scheme III to VIII Semester of 2018 - 22 batch. g. Minor Programme in CSE for 2019 -21 batch. **Discussion**: Based on the discussions following action, items as agreed upon by everyone were finalized and the same were circulated to all the members on 02nd April 2016. Persons responsible for these action items have already initiated the actions, which will be shared the next BoS meeting. The details of discussion are in ***Annexure 4.4***. **Action item *No.1: To improve problem solving skills at freshman year*** 1) Problem Solving with DS (18ECSP102). ***Action Item No.2: Students should have the ability to apply mathematical concepts and fundamental knowledge of core courses to solve computer science engineering problems.*** 1) Discrete Mathematical Structures- 19ECSC202-(3-1-0) ***2)*** Principles of Compiler Design -19ECSC203 -(3-1-0) ***Action Item No.3: Hands on implementation of protocols in networking*** 1) Computer Networks-2- 19ECSC303-(2-0-1.5) ***Action Item No.4: To enable students to build solutions for big data applications using current industrial tools.*** 1) Big data analytics (17ECSC401) ***Action Item No.5: The students should be able to design and develop a solution using software design principles*** 1) Senior Design project (20ECSW401) – (0-0-6) ***Action Item No.6: Elective for electrical sciences that is focused towards AI/ML job profiles.*** 1) Embedded Intelligent System(18ECSE302) ***Action Item No.7: Electives in all three verticals to be introduced student profile towards targeted job profile.*** 1) Wireless Adhoc& Sensor Networks -18ECSE406 - (3-0-0) 2) Advanced Parallel Computing - 18ECSE408 - (3-0-0) 3) Natural Language Processing -18ECSE403 - (3-0-0) 4) Software Architecture and Design Thinking -18ECSE410 - (3-0-0) 5) Model Thinking - 18ECSE411 - (3-0-0) 6) Computer Networks-1- 19ECSC302 -(3-1-0) 7) Java Programming -19ECSP301 - (1-0-1.5) - New Course 8) Semantic Web – 19ECSE303 – (3-0-0) 9) Block Chain Technology – 19ECSE301-(2-0-1) 10) The ARM Architecture – 19ECSE302-(2-1-0) ***Action Item No.8: To carte to above average students to enhance research skills in focused domains of networking, data analytics and AI/ML.*** 1) REU (17ECSE490) 2) IRP(17ECSE491)

Resolution 4.4: Resolved to approve the Schemes and Syllabi of the undergraduate program B.E in Computer Science and approve the same.

a. Approval of syllabi VII & VIII Semester of 2015 - 19 batch.
b. Ratification of scheme for 2016 - 20, 2017 - 21 batch.
c. Approval of syllabi V & VI Semester of 2016 - 20 batch.
d. Approval of syllabi III & IV Semester of 2017 - 21 batch.
e. Approval of syllabus I/II Semester of 2018 - 22 batch.
f. Approval of scheme III to VIII Semester of 2018 - 22 batch.
g. Minor Programme in CSE for 2019 -21 batch.

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School of Computer Science and Engineering
KLE Tech University
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BoS 4.5	To consider the Schemes and Syllabi of the postgraduate program in CSE. a) Approval of (scheme & syllabi) of 2018 - 20 batch.
	Discussion: Based on the discussions following action, items as agreed upon by everyone were finalized and the same were circulated to all the members on 02nd April 2016. Persons responsible for these action items have already initiated the actions, which will be shared the next BoS meeting. ***Action Item No.1: New Courses added*** 1. Applied Mathematics 2. Internet of Things 3. Computer Networks 4. Data Structure Lab 5. Python Programming Lab 6. Design and Analysis of Algorithms 7. Distributed and Cloud Computing 8. Machine Learning 9. Software Engineering 10. Image and Video Processing 11. Cryptography and Network security 12. PPEE 13. Embedded systems 14. CG and Vision 15. Parallel Computing 16. Social Network analysis 17. Wireless and Mobile Networks 18. Minor Project

Resolution 4.5: Resolved to approve the Schemes and Syllabi of the postgraduate program.

a) Approval of (scheme & syllabi) of 2018 - 20 batch.

BoS 4.6	Any other matter for discussion with the permission of the chair
	Nil

The Chairperson thanked all the members for the fantastic contributions

Dr. Meena S.M.

Chairperson, BoS, SoCSE

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Annexure 4.1

Discussion Item

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.

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Feedback for PG

1	Observations/ Recommendations based on feedback

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.

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.

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.

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Annexure 4.4	
Discussion Item	
Actions taken: Based on the feedback from stakeholders, employers, faculty, alumni and students the following actions are initiated.	**Course Revised/ Added**
	Courses Revised:
Course "Problem Solving with Data Structures" (18ECSP102) is introduced for second semester to strengthen the programming fundamentals using data structure concepts and logical thinking by applying problem solving skills and to solve online coding challenges.	Problem solving with DS(18ECSP102)
Tutorials included in DMS to enhance learning of fundamentals.	Discrete Mathematical Structures- 19ECSC202-(3-1-0)
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 this demonstration on the tools is performed.	Principles of Compiler Design - 19ECSC203 -(3-1-0)
	Courses Introduced:
To enable students to pre-process and handle big data and build application using mongoDB, HIVE, Casandra etc.	Big data analytics (17ECSC401)
SDP aims to design and develop a solution using software design principles: - design patterns (creational, behavioural & structural) , User experience (UX) design and API (application programming interface) that are generally followed in industries.	Senior Design project (20ECSW401) – (0-0-6)
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.	Embedded Intelligent System(18ECSE302)
1. IRP/SRP/REU projects in specialized domains introduced to enhance research skills in focused domain of networking, data analytics and AI/ML . 2. 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. **3.** 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.	REU (17ECSE490) IRP(17ECSE491)
Electives like model thinking, semantic web, block chain technology, the ARM architecture, wireless adhoc & sensor networks, advanced parallel computing, NLP and SADT were introduced to map projects that target towards job profile.	Wireless Adhoc& Sensor Networks -18ECSE406 - (3-0-0) Advanced Parallel Computing - 18ECSE408 - (3-0-0) Natural Language Processing - 18ECSE403 - (3-0-0) Software Architecture and Design Thinking -18ECSE410 - (3-0-0) Model Thinking - 18ECSE411 - (3-0-0) Computer Networks-1-19ECSC302 -(3-1-0) Java Programming -19ECSP301 - (1-0-1.5) - New Course Semantic Web – 19ECSE303 – (3-0-0) Block Chain Technology – 19ECSE301-(2-0-1) The ARM Architecture – 19ECSE302-(2-1-0)

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1. 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. 2. SDP aims to design and develop a solution using software design principles:- design patterns (creational, behavioural & structural) , User experience (UX) design and API (application programming interface) that are generally followed in industries. 3. Industry internship training is introduced to enable students for the industry ecosystem while working on live projects. 4. Industry internship projects are introduced to enable students to work on industry standards and deadline based project delivery. 5. The course on Problem solving with data structures is introduced at first year involving faculty from different disciplines.	Other course in the department

Annexure 4.5		
Discussion Item		
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. 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.	1. Applied Mathematics 18ECSC701 2. Internet of Things 18ECSC702 3. Computer Networks 18ECSC703 4. Data Structure Lab 18ECSP706 5. Python Programming Lab 18ECSP707 6. Design and Analysis of Algorithms 18ECSC709 7. Distributed and Cloud Computing 18ECSC710 8. Machine Learning 18ECSC711 9. Software Engineering 18ECSC712 10. Image and Video Processing 18ECSC713 11. Cryptography and Network 18ECSC714security 12. PPEE 18ECRC701 13. Embedded systems 18ECSE715 14. CG and Vision 18ECSE716 15. Parallel Computing 18ECSE802 16. Social Network analysis 18ECSE803 17. Wireless and Mobile Networks 18ECSE804 18. Minor Project 18ECSW808	07-04-2018

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School of Computer Science and Engineering

Program: Master of Technology		
Course Title: **Data Structures and Algorithms Lab**		Course Code: **18ECSP706**
L-T-P: **0-0-3**	Credits: **3**	Contact Hrs: **6 hrs/week**
ISA Marks: **80**	ESA Marks: **20**	Total Marks: **100**
Teaching Hrs: **72**	Exam Duration: **3 hrs**	

Course Content

1	**Introduction** Introduction to data structures, abstract data types and analysis of algorithms.	**04 hrs**
2	**Creation and manipulation of data structures** **Stacks and Queues :** Array implementation of stacks, queue, Circular queue and Applications of stacks and queues **Linked Lists:** Singly linked list, doubly linked list. Circular Singly and doubly Linked lists and Applications of linked list. **Trees and Graphs:** Introduction to trees, Binary search trees, binary tree and tree traversals, Basics of graphs, graph traversals and Applications of trees and graphs.	**06 hrs**
3	**Algorithms** Brute force and Decrease and conquer method : selection sort, insertion sort, radix sort and searching. **Hashing:** Direct Address Table, Hash Table, Hash Function and Collision Resolution Techniques.	**07 hrs**
4	**Variants of Tree Data Structures:** Dictionaries, Skip lists, Priority queues, Heaps, Leftist trees, AVL, Red Black, B-Trees, Alternative decision tree, Radix trees and Applications	**04 hrs**

Reference Books

1. Mark Allen Weiss, Data Structures and Algorithm Analysis in C, 2, Pearson Education, 2003
2. Aron M. Tenenbaum, Data Structures using C, 2, PHI, 2006
3. Sartaj Sahni, Data Structures, Algorithms and applications in C++, 2, Universities Press, 2008

4. Horowitz, Sahni, Rajasekaran, , Fundamentals of Computer Algorithms, 1, Galgotia Publications, 2010
5. Michael T. Goodrich, Roberto Tamassia, Algorithm Design and Applications, Wiley Publications, 2015

Course Content

Course Title: **Design and Analysis of Algorithms**	Course Code: **18ECSC709**	
L-T-P : 2-0-2	Credits: 4	Contact Hrs: **4 hrs/week**
ISA Marks: 50	ESA Marks: 50	Total Marks: 100
Teaching Hrs: (42+10)		Exam Duration: 03

Content	Hrs
1. Introduction Analysis Framework, Asymptotic Notations and Basic Efficiency Classes, Mathematical Analysis of Non-Recursive Algorithms and Mathematical Analysis of Recursive Algorithms.	**06 hrs**
2. Hashing Techniques Direct Address Table, Hash Table, Hash Function and Collision Resolution Techniques.	**06 hrs**
3. **Algorithm design techniques:** **Divide and conquer:** General Method, Merge sort, quick sort, Matrix Computations **Greedy Technique:** General Method, Huffmann Coding, knapsack problem, Task Scheduling and minimum spanning tree. **Dynamic Programming:** General Method, Floyd-Warshall algorithm, String Editing, Longest Common Subsequence and shortest paths	**15 hrs**
4. Combinatorial Problem solving Techniques: **Backtracking Method**: General Method, Sum of subsets, knapsack Problem and Game strategies **Branch and Bound method:** General Method, knapsack Problem,	**15 hrs**

Approximation algorithms and Randomized algorithms. **NP- Hard and NP Complete:** Examples, proof of NP-hardness and NP-completeness.	

Reference Books:

1. Introduction to Design and Analysis of Algorithms – Anany Levitin 3rd Edition, Pearson, 2012
2. T.H.Cormen, C.E.Leiserson, R.L.Rivest, C. Stein, Introduction to Algorithms, 3nd edition, MIT, 2009.
3. Michael T. Goodrich, Roberto Tamassia, Algorithm Design and Applications, Wiley Publications, 2015