Department of Computer Science and Engineering
National Institute of Technology Calicut
NIT Campus (PO), Calicut-673601, India

DCC Meeting Minutes

Date: 22/03/2023   **Time: 12:15 PM to 1:00 PM**   **Venue/Mode: CSED Seminar Hall**

Agenda Items:

1. Ratification of the minutes of the DCC meeting held on 06/03/2023
2. Action Taken Action Pending Report of the last DCC meeting
3. Approval of Curriculum for B Tech CS after incorporating suggestions from 58th BoAC meeting
4. PG Curriculum Revision

The DCC meeting started at CSED Seminar Hall at 12:15 PM. The Chairperson welcomed all members to the meeting.

Agenda Item 1: Ratification of the minutes of the DCC meeting held on 06/03/2023

The DCC ratified the confirmation of the minutes of the DCC meeting dated 06/03/2023.

Additionally, as the DCC has already decided to approve the requests for MCA internships outside the institute, the request from the following S6-MCA student to do an internship in the Industry is also approved.

S.No	Roll No	Name	Company	Internal Guide
1	M200685CA	Ashutosh Agnihotri	Nextuple India Pvt Ltd	Dr. Amit Praseed

Agenda Item 2: Action Taken Action Pending Report.

There are no actions pending and no actions to be taken, as per last DCC meeting.

Agenda Item 3: Approval of Curriculum for B Tech CS after incorporating suggestions from 58th BoAC meeting

The DCC approved the report of the department curriculum committee on curriculum revision after incorporating the suggestions received from the Department Advisory Board Members.   The following modifications proposed by the BoAC were approved.

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i)   Renaming of CS1002E Introduction to Computing to Introduction to Computing Science.
ii) Moving BT1001E Biology for Engineers to the second semester.
iii) Renaming all the three Project related courses as Project.

It was also resolved to rename the elective courses a) CS4041E Machine Learning to CS 4041E Introduction to Machine Learning and b) CS4051E Bioinformatics to CS4051E Introduction to Bioinformatics.

The report of the department curriculum committee is enclosed in Annexure I.

Agenda Item 4: PG Curriculum Revision

Prof Priya Chandran presented the proposed PG curriculums of MTech-CS(Annexure II), MTech CS-IS(Annexure III), prepared after deliberations in a faculty meeting and e-mail discussions among faculty members, for approval in DCC. Additionally, Prof Abdul Nazeer presented the proposed PG curriculum of MTech CS- AI & DA (Annexure IV) prepared after mail discussions among faculty members, for approval in DCC.

The changes from the previous curriculum in terms of core courses were discussed for all the three MTech Programmes and the changes were approved. The proposed titles and codes for the core courses of MTech CS, MTech CS-IS, and MTech CS- AI & DA were also approved after discussion.

The curriculum frameworks for MTech CS, MTech CS-IS, and MTech CS- AI & DA with the distribution of courses in 4 semesters was approved by the DCC and are attached.

The DCC entrusted the HOD to present the three proposals in BoAC for consideration.

The meeting ended at 01:10 PM on 22-03-2023.

Annexure I

REPORT OF THE UG CURRICULUM COMMITTEE CSED
Submitted to DAO for Senate Approval

22/03/2023

Introduction

The UG curriculum of NIT Calicut was considered for revision in 2022 in alignment with NEP 2020 and an Institute level committee with members from various departments was formed vide Note: NITC/Dean(Acad.)/Curriculum Revision/2021/1 dated 29-Apr-2021 by Dean (Academic), with Dr. A.P. Shashikala (Professor, CED) as the Chairperson and Dr Jayadeep U B (Associate Professor, MED) as Convenor. As per the Report of the Institute Curriculum Committee, the total number of credits for all B.Tech programs shall be between 150-153. The distribution of credits to the different curriculum baskets is as follows:

Table 1: Institute Curriculum Baskets

Programme Core (PC) + Programme Electives (PE) *Courses decided by the Dept. The core and elective distribution is left to the respective departments. No core courses in 4th year*	80-82
Open Electives (OE) *Courses within the Dept/Other Departments/approved on-line platforms with a cap on the maximum courses from such platforms decided by the Institute from time to time*	24-27
The PC+PE+OE credits must be in the range 106-109	

Institute Core (IC)	22
(Course contents can be programme-specific; to be completed by fourth semester) Maths-12, Prof. Communication-3, Prof. Ethics-1	16
Physics/Chemistry/Life Sciences (Any two can be decided by the Departments concerned)	06
Institute Elective (IE)	18
Entrepreneurship / Innovation Basket: *Courses to be proposed by the Department and approved by Institute Innovation Council*	3
Digital / Automation Technologies: Courses offered/identified by the Department - relating to programming / automation tools & techniques / Industry 4.0	6
Humanities, Social Science, Management Indian and Foreign languages, Economics, Engineering Management, Financial Management, Design Thinking etc.	9
Activity Points (AP)	04
Total Credits	150-153

The CSED Department Curriculum Committee was constituted vide DCC meeting dated February 9, 2023 with members Dr. K. Murali Krishnan, Dr. S. Sheerazuddin, Dr. Nirmal Kumar Boran, and Dr. Vinod P. (Convener). A draft curriculum was prepared and deliberated in the faculty meetings held on [21/02/2023 and 23/02/2023] and CSED DCC Meetings on [06/03/2023 and 22/03/2023].

Curriculum Proposed by the Department of Computer Science and Engineering

The curriculum has been prepared on the basis of the curriculum committee report, approved by the Senate and passed to the department. The salient features of the report are the following:
   a) The core courses of the curriculum.
      i)   Physics and Biology courses were included in the Institute Core from the Science basket
      ii) B.Tech CSE will require a minimum of 150 credits of which 82 will be from Program Core and Program Electives.
   b) The set of elective courses which we should include.

i) An initial list based on recently offered courses (based on students' demand) and faculty interest were proposed.

ii) To the above list, the suggestions from members of DAB were added.

Core Courses of the Curriculum:

The following table (Table 2) shows the core courses of the proposed new curriculum, in comparison with the curriculum core of the existing 2017 B.Tech curriculum.

CORE COURSE & CREDITS COMPARISON
Table 2: Proposed (2023) vs Existing (2017) Curriculum

2023 Curriculum	2017 Curriculum
Programming, Algo. and Software Design. Computer Programming - 3 Programming Laboratory - 2 Program Design - 3 Program Design Lab - 3 Data Structures and Algorithms - 4 Data Structures Lab - 3 Software Engineering - 4 Design and Analysis of Algorithms - 4 Introduction to Computing - 3 **29**	**Programming, Algo. and Software Design** Computer Programming - 2* [as Basic Engg] Program Design - 4 Programming Lab - 3 Data Structures and Algorithms - 4 Data Structures Lab - 3 Software Engineering - 4 **20**
Theory Discrete Structures I - 3 Theory of Computation - 3 Discrete Structures II - 3 **9**	**Theory** Discrete Structures - 4 Theory of Computation - 4 **8**
Hardware Logic Design - 3 Computer Organization - 4 Hardware Laboratory - 3 **10**	**Hardware:** Logic Design - 4 Computer Organization - 4 Hardware Laboratory - 3 Logic Design Laboratory - 2 **13**
Systems Operating Systems - 4 Compiler Design - 4 Database Management Systems - 4 Computer Networks - 4 **16**	**Systems** Operating Systems - 4 Compiler Design - 4 Database Management Systems - 4 Computer Networks - 4 **16**

Data Science Artificial Intelligence - 4 4	Data Science Artificial Intelligence - 4 4
Projects Summer Internship - 2 Mandatory Project - 3 Optional 3 cr Project *or* one Program Elective - 3 Optional 6 cr Project *or* two Program Electives - 6 **5+9**	**Projects** Project 1 - 3 Project 2 - 8 **11**
73 PC 9 PE (projects or electives) **Total PC+PE = 82**	70+2* =72 (above) 7 theory & 2 lab dept electives = 30-32 (approx.) **Total PC+DE = 102-104**

The modifications to the core courses were well discussed in the faculty and DCC meetings and the rationale for these changes is summarized below:

a) Design and Analysis of Algorithms is to be re-introduced as a core course, as faculty members felt that the course is of significant importance to be brought back into the core, not only from an academic perspective, but also from the viewpoint of industrial employability, as major design paradigms such as dynamic programming are discussed in the course.

b) The Discrete Structures course (4 lectures/week) is to be split into two courses (each of 3 lectures/week), to be taught in the first and second semester. The instructors who taught the course unanimously recommended that the course may be split due to two reasons i) the present contents are hard to cover in a semester ii) The course is offered in the first year and hence it is better to span the course across two semesters. The suggestion of one of the DAB members to have enough stress on Graph Theory will also be addressed through this change.

c) Logic Design Laboratory has been proposed to be removed, as it was resolved that one laboratory course would be sufficient on computer hardware, and elective laboratory courses may be added to the curriculum.

d) An invitation to Computer Science course is proposed to be introduced, so that students would get an introduction to computational thinking.

e) The Program Design theory & Laboratory, which were introduced in the previous curriculum as bridge course between the first semester programming theory & laboratory courses and the Data Structures and Algorithms theory & laboratory in the third semester, after discussion, was proposed to be retained in the curriculum, as the course has been found effective in balancing the differences in the backgrounds of various students entering the B.Tech programme.

f) For the effectiveness of the Computer Programming theory course, a core laboratory course of 2 credits is introduced in the first semester itself.

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g) As noted previously, the changes to the structure of B.Tech projects and internships are taken at the institute level, and hence not within the scope of our consideration.

On the basis of suggestions from BoAC the following additional modifications were introduced.

i) Renaming of CS1002E Introduction to Computing to Introduction to Computing Science.
ii) Moving BT1001E Biology for Engineers to the second semester.
iii) All the 3 Project related courses to be renamed as Project.

Structure of the Curriculum

The B.Tech CSE curriculum structure as per 2023 revision is as below:

Department of Computer Science and Engineering
National Institute of Technology Calicut
NIT Campus (P O), Calicut- 673 601, India.

Curriculum for B.Tech CSE
(2023 Admission onwards)
Submitted to Senate for Approval

Semester-I

Sl. No.	Course Code	Course Title	L	T	P	Credits	Category
1.	MA1xxxE	Mathematics I				3	IC
2.	MS1001E	Professional Communication				3	IC
3.	CS1001E	Computer Programming	3	0	0	3	PC
4.	CS1002E	Introduction to Computing Science	3	0	0	3	PC
5.	CS1003E	Discrete Structures I	3	0	0	3	PC
6	CS1091E	Programming Laboratory	0	0	3	2	PC
	Total Credits					17	

Semester-II

Sl. No.	Course Code	Course Title	L	T	P.	Credits	Category
1.	MA1xxxE	Mathematics II				3	IC
2.	PH1001E	Physics of Materials	3	0	0	3	IC
3	BT1001E	Biology for Engineers	3	0	0	3	IC
4.	CS1011E	Program Design	3	0	0	3	PC
5.	CS1012E	Logic Design	3	0	0	3	PC

6.	CS1013E	Discrete Structures II	3	0	0	3	PC
7.	CS1092E	Program Design Laboratory	1	0	3	3	PC
	Total Credits					**21**	

Semester-III

Sl. No.	Course Code	Course Title	L	T	P	Credits	Category
1.	MA2xxxE	Mathematics III				3	IC
2.	CS2001E	Data Structures & Algorithms	3	0	2	4	PC
3.	CS2002E	Computer Organization	3	0	2	4	PC
4.	CS2xxxE	EI Elective	3	0	0	3	EI
5.	CS2091E	Data Structures & Algorithms Laboratory	1	0	3	3	PC
6.	CS2092E	Hardware Laboratory	1	0	3	3	PC
	Total Credits					**20**	

Semester-IV

Sl. No.	Course Code	Course Title	L	T	P	Credits	Category
1.	MA2xxxE	Mathematics IV				3	IC
2.	CS2011E	Database Management Systems	3	0	2	4	PC
3.	CS2012E	Operating Systems	3	0	2	4	PC
4.	CS2013E	Theory of Computation	3	0	0	3	PC
5.	CS2019E	Professional Ethics	0	0	2	1	IC
6.		DA Elective - 1				3	DA
7.		Minor Course - 1				3#	MC
	Total Credits					**18 (+3#)**	

Semester-V

Sl. No.	Course Code	Course Title	L	T	P	Credits	Category
1.	CS3001E	Computer Networks	3	0	2	4	PC
2.	CS3002E	Compiler Design	3	0	2	4	PC
3.	CS3003E	Design & Analysis of Algorithms	3	0	2	4	PC
4.		Humanities Elective - 1				3	HM
5.		DA Elective - 2				3	DA
6.		Minor Course - 2				3#	MC
	Total Credits					**18 (+3#)**	

Semester-VI

Sl. No.	Course Code	Course Title	L	T	P	Credits	Category
1.	CS3011E	Software Engineering	3	0	2	4	PC
2.	CS3012E	Artificial Intelligence	3	0	2	4	PC
3.		Humanities Elective - 2				3	HM
4.		Open Elective - 1				3	OE
5.		Open Elective - 2				3	OE
6.	CS3099E	Project	0	0	9	3	PC
7.		Minor Course - 3				3#	MC
	Total Credits					**20 (+3#)**	

Semester-VII

Sl. No.	Course Code	Course Title	L	T	P	Credits	Category
1.		Humanities Elective - 3				3	HM
2.		Open Elective - 3				3	OE
3.		Open Elective - 4				3	OE
4.		Open Elective - 5				3	OE
5.		Open Elective - 6				3	OE
6.	CS4097E	Summer Internship				2	PC
7.	CS4098E /	Project / Programme Elective - 1				3	PE
8.		Minor Course - 4				3#	MC
	Total Credits					**20 (+3#)**	

Semester-VIII

Sl. No.	Course Code	Course Title	L	T	P	Credits	Category
1.	CS4099E /	Project / Programme Elective - 2, Programme Elective - 3				6	PE
2.		Open Elective - 7				3	OE
3.		Open Elective - 8				3	OE
4.		Activity Credits (minimum of 80 points)				4	AC
	Total Credits					**16**	

The courses of seventh and eighth semesters may be interchanged to facilitate external internships. Projects in S7 and S8 can both be internships.

Minimum Credits for the award of the degree: 150
IC – 22, PC - 73, PE – 9, OE – 24, IE –18 (EI – 3 HM – 9 DA – 6), AC – 4

Department Electives

The following is a list of courses including those prepared by various faculty members of the department and circulated to DAB members. Courses suggested by the DAB members are also incorporated.

Proposed List of Electives

Sl. No.	Course Code	Course Title	L	T	P	Credits	DA (Y/N)
1.	CS4021E	Logic for Computer Science	3	0	0	3	Y
2.	CS4022E	Program Analysis	3	0	0	3	Y
3.	CS4023E	Formal Semantics	3	0	0	3	Y
4.	CS4024E	Computational Complexity	3	0	0	3	Y
5	CS4025E	Formal Verification	3	0	0	3	Y
6	CS4026E	Vehicular Networks: Theory to Practice	3	0	0	3	Y
7	CS4027E	Computational Geometry	3	0	0	3	Y
8	CS4028E	Topics in Computational Geometry	3	0	0	3	Y
9	CS4029E	Principles of Programming Languages	3	0	0	3	Y
10	CS4030E	Foundations of Programming	3	0	0	3	Y
11	CS4031E	Network Security	3	0	0	3	Y
12	CS4032E	Computer Security	3	0	0	3	Y
13	CS4033E	Quantum Computation	3	0	0	3	Y
14	CS4034E	Advanced Computer Networks	3	0	0	3	Y
15	CS4035E	Topics in Combinatorics	3	0	0	3	Y
16	CS4036E	Algorithms in Optimization	3	0	0	3	Y
17	CS4037E	Topics in Algorithms	3	0	0	3	Y
18	CS4038E	Computational Algebra	3	0	0	3	Y
19	CS4039E	Computer Architecture	3	0	0	3	Y
20	CS4040E	Mathematical Foundations of Machine Learning	3	0	0	3	Y
21	CS4041E	Introduction to Machine Learning	3	0	0	3	Y
22	CS4042E	Randomized Algorithms	3	0	0	3	Y
23	CS4043E	Parameterized Algorithms	3	0	0	3	Y
24	CS4044E	Parameterized Complexity Theory	3	0	0	3	Y
25	CS4045E	Image Processing	3	0	0	3	Y
26	CS4046E	Deep Learning for Computer Vision	3	0	0	3	Y
27	CS4047E	Advanced Computer Architecture and Security	3	0	0	3	Y
28	CS4048E	Cloud Computing	3	0	0	3	Y
29	CS4049E	Distributed Computing	3	0	0	3	Y
30	CS4050E	Natural Language Processing	3	0	0	3	Y
31	CS4051E	Introduction to Bioinformatics	3	0	0	3	Y
32	CS4052E	Number Theory and Cryptography	3	0	0	3	Y
33	CS4053E	Data Mining	3	0	0	3	Y

34	CS4054E	Embedded Systems	3	0	0	3	Y
35	CS4055E	Object Oriented Systems	3	0	0	3	Y
36	CS4056E	Approximation Algorithms	3	0	0	3	Y
37	CS4057E	Data Privacy	3	0	0	3	Y
38	CS4058E	Coding Theory	3	0	0	3	Y
39	CS4059E	Term Paper	0	0	9	3	Y
40	CS4080E	Operating Systems Laboratory	1	0	3	3	Y
41	CS4081E	Compiler Laboratory	1	0	3	3	Y
42	CS4082E	Digital Design Laboratory	1	0	3	3	Y
43	CS4083E	Database System Design Laboratory	1	0	3	3	Y
44	CS4084E	Networks Laboratory	1	0	3	3	Y
45	CS4085E	Software Engineering Laboratory	1	0	3	3	Y
46	CS4086E	Systems Programming Laboratory	1	0	3	3	Y
47	CS4087E	Computer Security Laboratory	1	0	3	3	Y
48	CS4088E	Object Oriented Systems Laboratory	1	0	3	3	Y
49	CS4089E	Machine Learning Laboratory	1	0	3	3	Y
50	CS4090E	Image Processing Laboratory	1	0	3	3	Y

Feedback from members of DAB

The comments received from the members of the Department Advisory Board, as on this date, are summarized below:

DAB member	Comment	Action in Compliance
Dr. Rose Catharine Kanjirathingal, Linkedin, NY. (R&D Member, DAB)	Looking at the electives currently offered by the department, I'm really happy to see that Machine Learning and Deep Learning for Computer Vision are already listed there. These are highly relevant for today's industry R&D. A minor suggestion, if there is interest, would be to include a Deep Learning for Natural Language Processing (or alternate it with the CV elective) since a number of recent advances in CV were originally devised for NLP. Especially with ChatGPT making news everywhere, this would make for an interesting elective. Anyway, even without that, the choices of electives are really	The course Natural Language Processing is added in the elective list, which includes content on deep learning for natural language processing.

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	impressive	
Mr. Manoj Palat IBM Bangalore. (Industry Member, DAB)	I believe Graph Theory will be covered as part of the Data Structures course; if not it will be good to offer this. Cloud Computing/Distributed Computing – I didn't see this option in the list – would reflect the current industry scenario. Microservices : Related to the above, but a more specific industry oriented elective. As an aftermath of Data Science/ML, an elective on GPU based optimized code-generation based on LLVM would be good.	Graph theory is already covered in discrete structures, core courses and other electives. Courses on cloud computing and distributed computing are added to the electives.
Dr. Nithin Varma, CMI, Chennai. (Alumni Member, DAB.)	The revised curriculum and the core courses look good to me. My two suggestions for program electives are as follows: (1) Approximation Algorithms (2) Data Privacy	The suggested courses are added to the curriculum.

Proposed Curriculum 2023
for
M. Tech in Computer Science and Engineering

Semester I

Course Code	Course	Category	L(hours)	T(hours)	P(hours)	Credits
CS6101E	Mathematical Foundations of Computer Science	CS-core	4	0	0	4
CS6111E	Algorithms and Complexity	CS-core	4	0	0	4
	Elective Basket	Institute	2	0	0	2
CS6103E	Software Systems lab	CS-core	1	0	6	4
	Systems Soft-Core	PE	4/3	0	0/2	4
	Program Elective 1 (optional)	PE/other depts	4/3	0	0/2	4/3
	Total		14-19	0	6-10	18-22

Semester 2

Course Code	Course	Category	L(hours)	T(hours)	P(hours)	Credits
CS6191E	Mathematical Foundations of Machine Learning	CS-core	4	0	0	4
CS6198E	Project I	CS-core	0	0	4	2
	Program Elective 2	PE	4/3	0	0/2	4
	Program Elective 3	PE	4/3	0	0/2	4
	Program Elective 4	PE	4/3	0	0/2	4
	Program Elective 5 (optional)	PE/other depts	4/3	0	0/2	4/3
	Total		10-20	0	4-12	18-22

Semester 3

Course Code	Course	Category	L(hours)	T(hours)	P(hours)	Credits
CS6199E	Project II (from Summer Internship)	CS-core/Industry Internship	0	0	6	3
CS7198E	Project III	CS-core/Industry with conditions	0	0	30	15
	Program Elective 1 (optional)	PE/other depts	4/3	0	0/2	4/3
	Total		0-4	0	36-38	18-21

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Semester 4

Course Code	Course	Category	L(hours)	T(hours)	P(hours)	Credits
CS7199E	Project IV	CS-core/Industry with conditions	0	0	30	15
	Program Elective 5 (optional)	CS-core/other depts	4/3	0	0/2	4/3
	Total		0-4	0	30-32	15-19

- The student has to earn 75 credits to be eligible for M. Tech Degree
- Students aiming for industry internships may complete their course requirements in the first two semesters itself.
- The student has to credit 38 credits to be eligible for P.G Diploma. It may be done in the first two semesters with an optional project phase II in the department itself.
- For "Systems Soft Core" in Semester I, the student should credit one of the program electives tagged (with an asterix) as a systems core. In the current curriculum, the electives Compiler Design, Computer Architecture and Distributed Computing are tagged as systems core. The department may choose to tag newly proposed electives as systems core based on their content.
- Students may choose any course of appropriate level offered in the institute as program electives, with approval from the programme coordinator.
- Program Elective I and Program Elective 5 should be credited either in Semester I or III, and either in Semester II or IV respectively.

List of Elective Courses

	Course Code	Course Title	Credits
1	CS6102E*	Compiler Design	4
2	CS6112E*	Operating System Design	4
3	CS6141E*	Distributed Computing	4
4	CS6122E*	Computer Architecture	4
5	CS6121E	Computability Theory	4
6	CS6123E	Database Design	4
8	CS6124E	Topics in Programming Languages	4
9	CS6131E	Logic and Computation	4
10	CS6132E	Topics in Algorithms	4
11	CS6133E	Game Theory	4
12	CS6134E	Quantum Computation	4
13	CS6135E	Logic for Computer Science	4
14	CS6136E	Topics in Combinatorial Algorithms	4
15	CS6139E	Computational Geometry	3
16	CS6140E	Topics in Computational Geometry	3
17	CS6142E	Topics in Computer Architecture	4
18	CS6143E	Trends in Middleware Systems	4
19	CS6151E	Software Engineering	4
20	CS6152E	Object Oriented Modeling and Design	4
21	CS6154E	Topics in Database Design	4
22	CS6161E	Embedded Systems and Applications	4
23	CS6171E	Natural Language Processing	4

24	CS6318E	Artificial Intelligence	4
25	CS6173E	Image Processing	4
26	CS6174E	Pattern Recognition	4
27	CS6181E	Bioinformatics	4
28	CS6155E	Topics in Data Analytics	4
29	CS6145E	Heterogeneous Parallel Programming	4
30	CS6137E	Parameterized Algorithms	3
31	CS6138E	Parameterized Complexity Theory	3
32	CS6130E	Topics in Computational Complexity	4
33	CS6319E	Machine Learning	4
34	CS6393E	Machine Learning Laboratory	4
35	CS6201E	Cryptography	4
36	CS6211E	Formal Methods in Secure Computing	4
37	CS6212E	Network Security	4
38	CS6213E	Foundations of Information Security	4
39	CS6214E	Topics in Information Security	4
40	CS6231E	Theoretical aspects of cryptographic algorithms	4
41	CS6232E	Cryptocomplexity	4
42	CS6233E	Information Theory and Coding	4
43	CS6271E	Data Compression	4
44	CS6283E	Computer Laws and Ethics	4
45	CS6285E	Information Security Management	4
46	CS6203E	Information Security Laboratory	4
47	CS6202E	Systems Security	3
48	CS6301E	Introduction to Data Analytics	4
49	CS6302E	Information Retrieval	4
50	CS6303E	Statistical Foundations of Data Science	4
51	CS6304E	Advanced Deep Learning and Computer Vision	4
52	CS6305E	Neural Networks and Deep Learning	4
53	CS6306E	AI in Healthcare	4
54	CS6307E	Computational Linear Algebra	4
55	CS6308E	Computational Optimization Methods	4
56	CS6309E	High Performance Computing for AI	4
57	CS6310E	Intelligent Agents	4
58	CS6311E	Approximation Algorithms	4
59	CS6312E	Speech Information Processing	4
60	CS6313E	Advanced Data Structures and Algorithms	4
61	CS6314E	Internet of Things	4
62	CS6315E	Data Mining	4
63	CS6316E	Data Modeling and Visualization	4
64		Music Information Retrieval	3

Proposed Curriculum 2023

for

M. Tech in Computer Science and Engineering (Information Security)

Semester I

Course Code	Course	Category	L(hours)	T(hours)	P(hours)	Credits
CS6101E	Mathematical Foundations of Computer Science	CS-core	4	0	0	4
CS6111E	Algorithms and Complexity	CS-core	4	0	0	4
	Elective Basket	Institute	2	0	0	2
CS6103E	Software Systems lab	CS-core	1	0	6	4
CS6213E	Foundations of Information Security	CS-core	4	0	0	4
	Program Elective 1 (optional)	PE/other depts	4/3	0	0/2	4/3
	Total		14-19	0	6-10	18-22

Semester 2

Course Code	Course	Category	L(hours)	T(hours)	P(hours)	Credits
CS6191E	Mathematical Foundations of Machine Learning	CS-core	4	0	0	4
CS6198E	Project I	CS-core	0	0	4	2
	Program Elective 2	PE	4/3	0	0/2	4
	Program Elective 3	PE	4/3	0	0/2	4
	Program Elective 4	PE	4/3	0	0/2	4
	Program Elective 5 (optional)	PE/other depts	4/3	0	0/2	4/3
	Total		10-20	0	4-12	18-22

Semester 3

Course Code	Course	Category	L(hours)	T(hours)	P(hours)	Credits
CS6199E	Project II (from Summer Internship)	CS-core/Industry Internship	0	0	6	3

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CS7198E	Project III	CS-core/Industry with conditions	0	0	30	15
	Program Elective 1 (optional)	PE/other depts	4/3	0	0/2	4/3
	Total		0-4	0	36-38	18-21

Semester 4

Course Code	Course	Category	L(hours)	T(hours)	P(hours)	Credits
CS7199E	Project IV	CS-core/Industry with conditions	0	0	30	15
	Program Elective 5 (optional)	PE/other depts	4/3	0	0/2	4/3
	Total		0-4	0	30-32	15-19

- The student has to earn 75 credits to be eligible for M. Tech Degree
- Students aiming for industry internships may complete their course requirements in the first two semesters itself.
- The student has to credit 38 credits to be eligible for P.G Diploma. It may be done in the first two semesters with an optional project phase II in the department itself.
- Students may choose any course of appropriate level offered in the institute as program electives, with approval from the programme coordinator.
- Program Elective I and Program Elective 5 should be credited either in Semester I or III, and either in Semester II or IV respectively.

List of Elective Courses

	Course Code	Course Title	Credits
1	CS6201E	Cryptography	4
2	CS6211E	Formal Methods in Secure Computing	4
3	CS6212E	Network Security	4
4	CS6214E	Topics in Information Security	4
5	CS6231E	Theoretical aspects of cryptographic algorithms	4
6	CS6232E	Cryptocomplexity	4
7	CS6233E	Information Theory and Coding	4
8	CS6271E	Data Compression	4
9	CS6283E	Computer Laws and Ethics	4
10	CS6285E	Information Security Management	4
11	CS6203E	Information Security Laboratory	4
12	CS6202E	Systems Security	3
13	CS6102E	Compiler Design	4
14	CS6112E	Operating System Design	4
15	CS6141E	Distributed Computing	4
16	CS6122E	Computer Architecture	4
17	CS6121E	Computability Theory	4
18	CS6123E	Database Design	4

19	CS6124E	Topics in Programming Languages	4
20	CS6131E	Logic and Computation	4
21	CS6132E	Topics in Algorithms	4
22	CS6133E	Game Theory	4
23	CS6134E	Quantum Computation	4
24	CS6135E	Logic for Computer Science	4
25	CS6136E	Topics in Combinatorial Algorithms	4
26	CS6139E	Computational Geometry	3
27	CS6140E	Topics in Computational Geometry	3
28	CS6142E	Topics in Computer Architecture	4
29	CS6143E	Trends in Middleware Systems	4
30	CS6151E	Software Engineering	4
31	CS6152E	Object Oriented Modeling and Design	4
32	CS6154E	Topics in Database Design	4
33	CS6161E	Embedded Systems and Applications	4
34	CS6171E	Natural Language Processing	4
35	CS6318E	Artificial Intelligence	4
36	CS6173E	Image Processing	4
37	CS6174E	Pattern Recognition	4
38	CS6181E	Bioinformatics	4
39	CS6155E	Topics in Data Analytics	4
40	CS6145E	Heterogeneous Parallel Programming	4
41	CS6137E	Parameterized Algorithms	3
42	CS6138E	Parameterized Complexity Theory	3
43	CS6130E	Topics in Computational Complexity	4
44	CS6319E	Machine Learning	4
45	CS6393E	Machine Learning Laboratory	4
46	CS6301E	Introduction to Data Analytics	4
47	CS6302E	Information Retrieval	4
48	CS6303E	Statistical Foundations of Data Science	4
49	CS6304E	Advanced Deep Learning and Computer Vision	4
50	CS6305E	Neural Networks and Deep Learning	4
51	CS6306E	AI in Healthcare	4
52	CS6307E	Computational Linear Algebra	4
53	CS6308E	Computational Optimization Methods	4
54	CS6309E	High Performance Computing for AI	4
55	CS6310E	Intelligent Agents	4
56	CS6311E	Approximation Algorithms	4
57	CS6312E	Speech Information Processing	4
58	CS6313E	Advanced Data Structures and Algorithms	4
59	CS6314E	Internet of Things	4
60	CS6315E	Data Mining	4
61	CS6316E	Data Modeling and Visualization	4

Department of Computer Science and Engineering

National Institute of Technology Calicut

M.Tech. Programme in

Computer Science and Engineering (Artificial Intelligence & Data Analytics)

Curriculum

(Third Draft based on the Senate approved framework and DCC recommendations)

Semester 1

Course Code	Course Title	Category	Lecture (L)	Tutorial (T)	Practical/ Seminar (P/S)	Credits
CS6318E	Topics in Artificial Intelligence	CS-Core	3	0	2	4
CS6191E	Theoretical Foundations of Machine Learning	CS-Core	4	0	0	4
CS6301E	Introduction to Data Analytics	CS-Core	3	0	2	4
	Elective Basket	Institute	2	0	0	2

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	AIDA Soft-Core	PE	4/3	0	0/2	4
	Programme Elective 1 (Optional)	PE/Other Depts	4/3	0	0/2	4/3
	Total		15-20	0	4-8	18-22

Semester 2

Course Code	Course Title	Category	Lecture (L)	Tutorial (T)	Practical/ Seminar (P/S)	Credits
CS6319E	Machine Learning	CS-Core	4	0	0	4
CS6393E	Machine Learning Laboratory	CS-Core	1	0	6	4
CS6398E	Project I	CS-Core	0	0	4	2
	Programme Elective 2	PE	4/3	0	0/2	4
	Programme Elective 3	PE	4/3	0	0/2	4
	Programme Elective 4 (Optional)	PE/Other Depts	4/3	0	0/2	4/3
	Total		11-17	0	10-16	18-22

Semester 3

Course Code	Course Title	Category	Lecture (L)	Tutorial (T)	Practical/ Seminar (P/S)	Credits
CS6399E	Project II (from Summer Internship)	CS/Industry Internship	0	0	6	3
CS7398E	Project III	CS/Industry with conditions	0	0	30	15
	Programme Elective 1 (Optional)	PE/Other Depts	4/3	0	0/2	4/3
Total Credits						18-22

Semester 4

Course Code	Course Title	Category	Lecture (L)	Tutorial (T)	Practical/ Seminar (P/S)	Credits
CS7399E	Project IV	CS/Industry with	0	0	30	15

		conditions				
	Programme Elective 4 (Optional)	PE/Other Depts	4/3	0	0/2	4/3
Total Credits						15-19

Note:

(i) The student has to earn a minimum of 75 credits to become eligible for the M.Tech degree.

(ii) Those aiming for industry internships may complete their course requirements in the first two semesters itself.

(iii) The student has to earn 38 credits to become eligible for P. G Diploma. It may be done in the first two semesters with an optional Project Phase II in the department itself.

(iv) For the "AIDA Soft-Core" in Semester I, the student should credit one of the Programme Electives tagged (with an asterisk) as an AIDA Soft-Core. In the current curriculum, the electives CS6305E Neural Networks and Deep Learning, CS6371E Natural Language Processing, and CS631E Data Mining are tagged as "AIDA Soft-Core". The department may choose to tag newly proposed electives as "AIDA Soft-Core", based on their content.

(v) Students may choose any course of appropriate level offered in the Institute as Programme Electives, with approval from the Programme Coordinator.

List of Elective Courses

Sl. No.	Course Code	Course Title	Credits
1	CS6155E	Topics in Data Analytics	4
2	CS6302E	Information Retrieval	4

3	CS6303E	Statistical Foundations of Data Science	4
4	CS6304E	Advanced Deep Learning and Computer Vision	4
5	CS6305E	Neural Networks and Deep Learning*	4
6	CS6306E	AI in Healthcare	4
7	CS6307E	Computational Linear Algebra	4
8	CS6308E	Computational Optimization Methods	4
9	CS6309E	High Performance Computing for AI	4
10	CS6310E	Intelligent Agents	4
11	CS6311E	Approximation Algorithms	4
12	CS6312E	Speech Information Processing	4
13	CS6313E	Advanced Data Structures and Algorithms	4
14	CS6314E	Internet of Things	4
15	CS6315E	Data Mining*	4
16	CS6316E	Data Modeling and Visualization	4
17	CS6317E	Term Paper	4
18	CS6171E	Natural Language Processing*	4
19	CS6151E	Software Engineering	4
20	CS6154E	Topics in Database Design	4

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21	CS6133E	Game Theory	4
22	CS6173E	Image Processing	4
23	CS6181E	Bioinformatics	4
24	CS6174E	Pattern Recognition	4
25	CS6141E	Distributed Computing	4
26	CS6201E	Cryptography	4
27	CS6112E	Operating System Design	4
28	CS6213E	Foundations of Information Security	4
29	CS6132E	Topics in Algorithms	4
30	CS6122E	Computer Architecture	4
31	CS6283E	Computer Laws and Ethics	4
32	CS6102E	Compiler Design	4
33	CS6135E	Logic for Computer Science	4
34	CS6101E	Mathematical Foundations of Computer Science	4
35	CS6111E	Algorithms and Complexity	4
36	CS6103E	Software Systems Laboratory	4