श्री माता वैष्णो देवी विश्वविद्यालय

SHRI MATA VAISHNO DEVI UNIVERSITY, KATRA

SCHOOL OF COMPUTER SCIENCE & ENGINEERING

No. SMVDU/SoCSE/2025/360 **Date: 24.02.2025**

Subject: Minutes of the 17th Meeting of Board of Studies of School of Computer Science and Engineering held on 20.2.25 (Thursday) at 10:00 A.M in online Mode

The following members attended the meeting:

1. Prof. Vijay Laxmi, Professor, Deptt. of Computer Science & Engg. MNIT Jaipur
2. Dr. Sunanda Head, SCSE
3. Dr. Ajay Kaul
4. Dr. Baijnath Kaushik
5. Dr. Pooja Sharma
6. Dr. Sakshi Arora
7. Mr. Manoj Kumar Verma
8. Dr. Sonika Gupta
9. Mr. Sanjay Kumar Sharma
10. Dr. Deo Prakash
11. Mr. Sudesh Kumar
12. Dr. Archana Purwar
13. Dr. Rohit Tanwar
14. Dr. Vipal Kumar Sharma

IS Dr. Manoj Kr. Gupta

The agenda items were placed before the members of the Board of Studies and the following discussions/recommendations were made:

<u>Agenda item No.1</u>: To review and approve the Course Structure for M.Tech. in Artificial Intelligence (AI) w.e.f Entry Batch 2025.

The matter regarding consideration and approval of the Course structure for M.Tech in Artificial Intelligence was placed before the Board and the discussions were held. After going through the course structure, few modifications were suggested. They are as follows:

1. Change in the subject offered in M.Tech 1st semester from Mathematical foundations of Machine Learning to "Mathematical foundations for AI"
2. Removing the Subject "Deep Learning" and "Deep Learning Lab". Introducing in its place the subject "Advances in AI and ML" and the lab "Advances in AI and ML Lab"
3. Including the subject "Neural Networks and Fuzzy Logic" in the category of Elective-1

4. Removing the Course "Neural Networks and Fuzzy Logic " from the category of Elective-1 and Introducing two courses "Digital Twin" and "Robotics and Vision Control" in the category of Elective-II.
   The board approved the above agenda item after modifications. The approved course structure is given at **Annexure 'A'.**

Agenda item No.2: To consider and approve the retroactive updates in the course structure of B.Tech Computer Science & Engineering Programme (Entry Batch 2023)

The board was apprised about the overall restructuring of course structure of B.Tech (Entry Batch 2023) of the school which was undertaken keeping in view the following:

I. Revision made to the Value Added Course (VAC-3) offered to B.Tech CSE 3rd Semester students.

   Under the Value Added Course (VAC) Category; "Environmental Science & Education" course was offered in place of "Introduction to Logic" for B.Tech. CSE 3rd Semester students.

II. Revision made to the School Elective Course (SEC-3) offered to B.Tech CSE 3rd Semester students.
   Under the School Elective Course (SEC) Category; Initially "Artificial Intelligence Constraint Satisfaction Problems" course was only offered. However, now, the student can choose any of the courses offered under the category of SEC-3 Bucket.

III. Revision made to the MAC 2 offered to B.Tech CSE 4th Semester students.
   Under the MAC 2 Category; Initially "Environmental Science & Education" course was offered. However, as the students had already studied the subject under the category of VAC-3. Also, MAC 2 course has been removed from 4th semester. Total credits remain unchanged.

IV. To approve the credit distribution (L-T-P) of School Elective courses.

   The credit distribution (L-T-P) of School Elective courses has been updated, though the total number of credits remain unchanged. The modified list of School Elective courses includes the addition of practical and tutorial components, based on feedback received from faculty members and students.

V. Change in Credits of Major Project/ Internship and Removal of General Elective – IV offered to B.Tech. CSE 8th Semester students.

The total credits of Major Project/ Internship have been changed from 7 credits to 10 credits. The General Elective –IV offered through NPTEL has been removed. Total credits for the 8th semester remain unchanged.

Keeping in view the changes desired due to the adoption of NEP2020 framework; the BoS approved the retroactive adoption in the course structure of B.Tech. Computer Science & Engineering (2023 Batch). The approved changes to various courses shifted/removed is given in **Annexure 'B'.**

Agenda item No. 3: To consider and approve the changes made to Course Structure of B.Tech (CSE) program (w.e.f Entry Batch 2024)

The board was apprised about the overall restructuring of course structure of B.Tech (w.e.f Entry Batch 2024) of the school which was undertaken keeping in view the following:

I. To consider and approve the shifting of the course "Discrete Structures" (MTL BS106) and change in its credits.

Shifting of the course "Discrete Structures" (MTL BS201) from 3rd semester to 2nd semester. Change of course code from (MTL BS 201) to (MTLBS 106) and also change of credits from 3 credits (3-0-0) to 4 credits (3-1-0).

II. To consider and approve the removal of the course "Biology for Engineers" (BTL BS201) from B.Tech CSE 2nd Semester and introduction of "Introduction to Biology for Engineers" (BTLBS 201) in B.Tech CSE 3rd Semester.

The course "Biology for Engineers" (BTLBS102) to be removed from 2nd semester. Inclusion of the Course "Introduction to Biology for Engineers" (BTLBS 201) in 3rd Semester.

III. To consider and approve the shifting of the course "Environmental Science & Education" (BTL VA202) from 3rd semester to 4th semester.

The course Environmental Science & Education (BTL VA202) shall be offered as Value Added Course (VAC-4) in the 4th semester as a mandatory VAC course. In the 2023 batch, this course was offered as VAC3 in the 3rd semester.

Keeping in view the changes desired due to the adoption of Model curriculum (**Annexure 'I'**) from the minutes of the meeting of the 36th AC; the BoS approved the retroactive adoption in the course structure of B.Tech. Computer Science & Engineering (w.e.f Entry Batch 2024). The approved changes to various courses shifted/removed is given in **Annexure 'E'.**

Agenda item No. 4: To consider and approve the retroactive updates for the courses offered to Engineering and Non Engineering students under the category of AEC/VAC/SEC courses

The following courses under the category of AEC/VAC/SEC, were offered to Engineering and Non-Engineering students of other schools in the Odd and even Semester; for the 2024-25 batch, on the basis of the feedback received from students and faculty members:

In the Odd Semester 2024-25 Session:

Course Code	Course Title	L-T-P	Credits	Course Category (AEC/VAC/SEC/Open Elective/School elective, etc)	Offered to (All/Engg/Non-Engg/any specific Programme)
CSL AE101	Introduction to Computer Application	2-0-0	2	AEC	ALL
CSL SE105	AI in Applications	2-0-0	2	SEC	ALL
Noc24-cs88	Artificial Intelligence : Search Methods For Problem solving		2		For B.Tech CSE 3rd Semester through NPTEL
CSE 4001	Fundamental of Cloud Computing		Non-Credit	Open Elective	For other B.Tech.8th Semester programs as Non Elective course

In the Even Semester 2024-25 Session:

Course Code	Course Title	L-T-P	Credits	Course Category (AEC/VAC/SEC/Open Elective/School elective, etc)	Offered to (All/Engg/Non-Engg/any specific Programme)
CSL VA102	Introduction to Artificial Intelligence	2-0-0	2	VAC	ALL
CSL AE102	Introduction to Cyber Security	2-0-0	2	AEC	ALL
CSL SE102	Introduction to Cloud Computing	2-0-0	2	SEC	Non-Engg
CSL SE104	Introduction to Programming using Python	2-0-0	2	SEC	Non-Engineering

The board approved the above agenda keeping in mind the interests of (Engg. And Non Engg.) Students of other streams; regarding AEC/VAC/SEC courses.

Agenda item No. 5: To consider and approve the retroactive update of the course credits for the subject "Software Defined Networks".

The course credits of the subject "Software Defined Networks" offered to B.Tech (CSE 5th Semester, 2022 Batch) and M.Tech (CSE 3rd Semester, 2023 Batch) is modified from (2-0-2) credits (3-0-0) credits as per the AAC dated 10 September 2024.

The Board approved the same.

Agenda item No. 6: To consider and approve the course structure of B.Tech CSE for Entry Batch 2023 and Entry Batch 2024

The board was apprised about the overall restructuring of course structure of B.Tech (w.e.f Entry Batch 2024) of the school which was undertaken keeping in view the following:

I. To consider and approve the updated course structure offered to students of B.Tech CSE program w.e.f. Entry Batch 2023 as attached in **Annexure 'B'**
II. To consider and approve the updated course structure offered to students of B.Tech CSE program w.e.f. Entry Batch 2024 as attached in **Annexure 'E'.**
III. To consider and approve the updated Course Credits (L-T-P) of the elective courses offered and inclusion of new courses under the School Elective Course category as attached in **Annexure 'D'**. The revised list of School Elective courses now includes

practical and tutorial components, incorporating feedback from both faculty members and students.

IV. To consider and approve the removal of Comprehensive Exam (CSS PR302) from B.Tech CSE 6th Semester.

Keeping in view the changes desired due to the adoption of Model curriculum (**Annexure 'I'**) from the minutes of the meeting of the 36th AC; the BoS approved the adoption in the course structure of B.Tech. Computer Science & Engineering (w.e.f Entry Batch 2024).

Agenda item No. 7: To consider and approve the retroactive adoption of NEP 2020 Framework for B.Tech (Computer Science and Engineering) Honors and for Minor Specialization [w.e.f Entry Batch 2023]

For B. Tech. (Honor's) Program:

The four-year B. Tech. (Honor's) degree in the Major discipline will be awarded to those who have completed the credit requirement of a four-year B.Tech. degree program and earned 12 Additional Credits through DEC's; provided that a minimum of seven DEC's earned are from the basket of a particular specialization/domain.

Department Elective Course – 7	4	DEC
Department Elective Course – 8	4	DEC
Department Elective Course – 9	4	DEC

These elective courses can be registered during V to VIII semester subject to a maximum limit of course registration up to 32 credits, including core and other courses. On exit, student shall be awarded B.Tech.(Honor's) in Major discipline with specialization in the specific domain.

B. Tech. Program with Minor/Interdisciplinary Area Specialization:

The four-year B. Tech. degree in the Minor/Interdisciplinary Area in a specific domain will be awarded to those who have completed the credit requirement of four-year B. Tech degree program and earned 12 Additional Credits through GECs; provided all credits earned through GECs are from the basket of a particular Minor.

Generic Elective Course – 5	4	GEC
Generic Elective Course – 6	4	GEC
Generic Elective Course – 7	4	GEC

The set of courses required to be taken, by students of other School, to obtain Minor/Interdisciplinary Area Specialization will be clearly defined by each School for the benefit of the students [**Annexure 'H'**]. The four-year B. Tech. degree with Minor in a specific domain

will be awarded to those who complete a four-year degree program with 172 credits and have satisfied the credit requirement. A student, who wishes to pursue B. Tech. with Minor, shall earn 12 additional credits from General Elective courses; provided all 7 GECs (GEC1 to GEC7) are earned from the basket of courses prescribed for that particular Minor.

1. To consider and approve the retroactive adoption of NEP 2020 Framework for B.Tech (Computer Science and Engineering) Honors in Data Science and Artificial Intelligence

   List of DEC's submitted for consideration and approval for the B.Tech CSE Honors in Data Science and Artificial Intelligence after discussions with faculty and students is as follows:

B.Tech. CSE Honors. in Data Science & Artificial Intelligence

List of School Electives For B.Tech. CSE						
S. No.	**Course Code**	**Course Title**	**L**	**T**	**P**	**C**
		DEC – I				
1	CSL DE301	Software Defined Networks	3	0	2	4
2	CSL DE303	Storage Networks	3	1	0	4
3	CSL DE305	Computer Vision	3	1	0	4
4	CSE DE307	Web Programming	3	0	2	4
5	CSL DE309	Block Chain Technology	3	1	0	4
6	CSL DE311	Data Visualization **(Hon. DS & AI)**	3	0	2	4
		DEC – II				
1	CSL DE313	Probability & Stochastic Processes **(Hon. DS & AI)**	3	1	0	4
2	CSL DE315	Cloud Computing	3	1	0	4
3	CSL DE317	Parallel & Distributed Computing	3	1	0	4
4	CSL DE319	Advanced Mobile Communication using 5G	3	1	0	4
5	CSL DE325	Advanced Computer Architecture	3	1	0	4
6	CSL DE323	Computer Network Security	3	0	2	4
		DEC – III				
1	CSL DE302	Data mining & warehousing **(Hon. DS & AI)**	3	0	2	4
2	CSL DE304	Human Computer Interaction	3	1	0	4
3	CSL DE306	Quantum Computing	3	0	2	4
4	CSL DE308	Mobile & App Development	3	1	0	4
		DEC – IV				
1	CSL DE322	Digital twin **(Hon. DS & AI)**	3	0	2	4
2	CSL DE310	Internet of Things **(Hon. DS & AI)**	3	1	0	4
3	CSL DE312	Wireless Networks	3	0	2	4
4	CSL DE314	Information Coding Practices	3	1	0	4
5	CSL DE316	Computer Embedded Systems	3	1	0	4
6	CSL DE318	Multimedia and Virtual Reality	3	1	0	4
7	CSL DE320	High Performance Computing	3	1	0	4
		DEC – V				
1	CSL DE401	Nature Inspired Algorithms **(Hon. DS & AI)**	3	0	2	4
2	CSL DE411	Robotics & Vision Control **(Hon. DS & AI)**	3	1	0	4

3	CSL DE403	Metaheuristic Design Framework	3	1	0	4
4	CSL DE405	Cyber Security	3	1	0	4
5	CSL DE407	E-Commerce & Cyber Laws	3	1	0	4
6	CSL DE409	Digital Forensic	3	1	0	4
DEC – VI						
1	CSL DE413	Natural Language Processing **(Hon. DS & AI)**	3	1	0	4
2	CSL DE415	Foundation Models **(Hon. DS & AI)**				

2. To consider and approve the retroactive adoption of NEP 2020 Framework for B.Tech with Minor Specialization in Artificial Intelligence (For students of Other Engg. departments)

List of GEC's submitted for consideration and approval for the B.Tech with Minor specialization in Artificial Intelligence after discussions with faculty and students:

	Minor Specialization in Artificial Intelligence				
Course Code	**Course Title**	**L**	**T**	**P/S**	**Credits**
CSL GE301	Introduction to Artificial Intelligence	3	1	0	4
CSL GE305	Probability & Statistics	3	1	0	4
CSL GE302	Introduction to Machine Learning	3	0	2	4
CSL GE306	Data Analytics	3	0	2	4
CSL GE401	Soft Computing	3	0	2	4
CSL GE405	Natural Language Processing	3	1	0	4
CSL GE402	Artificial Intelligence for Engineering Applications	3	1	0	4
CSL GE406	Prompt Engineering	3	1	0	4
CSL GE410	Vision Transformers	3	1	0	4

7.3 To consider and approve the retroactive adoption of NEP 2020 Framework for B.Tech with Minor Specialization in Information Security (For students of Other departments)

List of GEC's submitted for consideration and approval for the B.Tech with Minor specialization in Information Security after discussions with faculty and students:

	Minor Specialization in Information Security				
Course Code	**Course Title**	**L**	**T**	**P/S**	**Credits**
CSL GE303	Computer Network & Communication	3	0	2	4

CSL GE307	Information & Coding Practices	3	1	0	4
CSL GE304	Wireless Networks	3	0	2	4
CSL GE308	Internet of Things	3	0	2	4
CSL GE403	Introduction to Cyber Security	3	1	0	4
CSL GE407	Block Chain Technology	3	1	0	4
CSL GE404	Privacy & Security in Online Social Media	3	1	0	4
CSL GE408	Information Response & Management	3	1	0	4
CSL GE412	Cloud Computing	3	1	0	4

The Board after discussion and deliberation approved the same.

Agenda item No. 8: To review and approve the proposed syllabus for the following courses, based on curriculum feedback from stakeholders.

Due to the inclusion of lot many courses under the category of AEC/VAC/SEC/Open Electives/GECs/DECs; there was a need for approval of the syllabus of lot many courses. The detailed syllabus of the subjects specified below is attached in **Annexure 'F'.**

S.No	Course Code	Course Title	L	T	P	C	Offered As
1	CSL DE301	Software Defined Networks	3	0	2	4	DEC
2	CSL DE311	Data Visualization	3	0	2	4	DEC
3	CSLDE302	Data Mining & Warehousing	3	0	2	4	DEC
4	CSLDE310	Internet of Things	3	0	2	4	DEC
5	CSL DE312	Wireless Networks	3	0	2	4	DEC
6	CSLDE401	Nature Inspired Algorithms	3	0	2	4	DEC
7	CSL DE321	Business Analytics with R	3	0	2	4	Major Sp
8	CSL GE301	Introduction to Artificial Intelligence	3	1	0	4	Minor

9	CSL VA102	Introduction to Artificial Intelligence	2	0	0	2	VAC
10	CSL SE102	Introduction to Cloud Computing	2	0	0	2	SEC
11	CSL GE305	Probability & Statistics	3	1	0	4	Minor
12	CSL GE306	Data Analytics	3	0	2	4	Minor
13	CSL DC104	Data Structure	3	0	0	3	CSE 2nd Sem
14	CSL DE323	Computer Network Security	3	0	2	4	DEC
15	CSLDC302	Deep Learning	3	0	0	3	Cse 6th sem
16	CSLDC305	Machine Learning	3	0	0	3	Cse 5th sem
17	CSL C202	Soft Computing	3	0	0	3	Cse 4th sem
18	CSL DE320	High Performance Computing	3	1	0	4	DEC
19	CSE 4001	Fundamentals of Cloud Computing		Non-Credit			Open Elective
20	CSL SE104	Introduction to Programming using Python	2	0	0	2	SEC
21	CSL SE105	Artificial Intelligence in Applications	2	0	0	2	SEC
22	CSL GE403	Introduction to Cyber Security	3	1	0	4	Minor Specialization

The discussion was held in this regard and the Board approved the same.

<u>Agenda item No.9</u>: To change the name of the following courses being offered to B.Tech Mathematics & Computing 2nd Semester students.

"Introduction to Python Programming" to "Programming using Python"

"Introduction to Python Programming Lab: to "Python Programming Lab"

Since both the courses have same course code and L-T-P and are being offered to B.Tech CSE 2nd Sem and B.Tech Mathematics and Computing 2nd Sem.

The board approved and recommended the change of Course Title for B.Tech Mathematics and Computing from "Introduction to Python Programming" to "Programming using Python" for the theory subject. and "Introduction to Python Programming Lab: to "Python Programming Lab for the lab component.

The meeting ended with the vote of thanks.

Dr. Sakshi Arora
Member Sec. BoS

Dr. Ajay Koul
Member BoS

Mr. Manoj Kumar Verma
Member BoS

Dr. Pooja Sharma
Member BoS

Dr. Baijnath kaushik
Member BoS

Dr. Naveen Kr. Gondhi
Member BoS

Dr. Sonika Gupta
Member BoS

Mr. Sanjay Kumar Sharma
Member BoS

Dr. Deo Prakash
Member BoS

Mr. Sudesh Kumar
Member BoS

Dr. Archana Purwar
Member BoS

Dr. Rohit Tanwar
Member BoS

Dr. Vipal Kr. Sharma
Member BoS

Dr. Manoj Kr. Gupta
Member BoS

-Sd-
Prof. Vijay Laxmi
External Expert
(Approval Enclosed)

Dr. Sunanda
Chairman and Head SoCSE

HoD DCSE <hod.dcse@smvdu.ac.in>

Incorporation of Changes and Approval of Minutes from 17th BoS Meeting

Vijay Laxmi <vlaxmi@mnit.ac.in>
To: HoD DCSE <hod.dcse@smvdu.ac.in>

21 February 2025 at 18:42

Dear Madam,
Thanks. Minutes are approved from my side and may be submitted for further processing.
Regards

Dr. Vijay Laxmi
Professor (Computer Science and Engineering)
Malaviya National Institute of Technology
Jaipur - 302017
India

[Quoted text hidden]

(Approved Under Section 2(f) and 12(B) of UGC act of 1956)
Shri Mata Vaishno Devi University
School of Computer Science and Engineering
Faculty of Engineering, SMVDU
Kakryal, Katra 182320

20.2.25

List of Electives

Course Code	Course Title	L-T-P	Credit
Elective – I			
	Social Media Analytics	3-1-0	4
	Optimization Techniques	3-1-0	4
	Design & ~~Analysis of~~ Algorithms Analysis	3-1-0	4
	Nature Inspired Algorithms	3-1-0	4
	Graph Theory	3-1-0	4
	Neural Networks & Fuzzy Logic	3-1-0	4

Course Code	Course Title	L-T-P	Credit
Elective II			
	Pattern Recognition	3-1-0	4
	Data Mining	3-1-0	4
	Soft Computing	3-1-0	4
	High Performance Computing	3-1-0	4
	Digital Twin	3-1-0	4
	Robotics and Vision Control	3-1-0	4

(Approved Under Section 2(f) and 12(B) of UGC act of 1956)
Shri Mata Vaishno Devi University
School of Computer Science and Engineering
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Kakryal, Katra 182320

20.2.25

Course Structure of
M. Tech (Artificial Intelligence) programme
[Entry Batch 2025]

Semester I **First Year**

S.No	CourseCode	CourseTitle	L	T	S/P	Credit
1		Machine Learning	3	0	0	3
2		Machine Learning Lab	0	0	2	1
3		Mathematical Foundations for AI	3	1	0	4
4		Research Methodology	4	0	0	4
5		Image & Video Processing	3	0	0	3
6		Image & Video Processing Lab	0	0	2	1
7		Elective I	4	0	0	4
		TotalCredits	17	1	4	20

Semester II **First Year**

S. No	CourseCode	CourseTitle	L	T	S/P	Credit
1		Natural Language Processing	3	1	0	4
2		Data Analytics	3	0	0	3
3		Data Analytics Lab	0	0	2	1
4		Advances in AI & ML	3	0	0	3
5		Advances in AI & ML Lab	0	0	2	1
6		Elective-II	3	1	0	4
7		Open Elective-1	3	1	0	4
		TotalCredits	15	3	4	20

Semester III **Second Year**

S. No	CourseCode	CourseTitle	L	T	S/P	Credit
1		Dissertaion Preliminary	0	0	40	20
		Total Credits				20

Semester IV **Second Year**

S. No	Course Code	Course Title	L	T	S/P	Credit
1		Dissertation Final	0	0	40	20
		Total Credits				20

Total credits in M.Tech (CSE) =80

Minimum Total Credits to be earned in order to become eligible for award of M.Tech. (Two Year Full Time) Degree: 80

Dated: 20.2.25

Annexure "B"

Course Structure of
B. Tech (Computer Science & Engineering) programme
[Entry Batch 2023]

Semester I

Course Type	Course Code	Course Title	L	T	P/S	Credits
BSC 1	MTL BS101	Engineering Mathematics-I	3	1	0	4
BSC 2	PHL BS101	Engineering Physics	3	0	0	3
BSC 2	PHP BS101	Engineering Physics Lab	0	0	2	1
ESC 1	CSL ES101	Introduction to C Programming	3	0	0	3
ESC 1	CSP ES101	C Programming Lab	0	0	2	1
ESC 2	ECL ES103	Digital Electronics	3	0	0	3
ESC 2	ECP ES103	Digital Electronics Lab	0	0	2	1
SEC 1	MEM SE103	Engineering Graphics with CAD	1	0	2	2
AEC 1 / VAC 1		Ability Enhancement /Value Added Course				2
		Total Credits				**20**

Semester II

Course Type	Course Code	Course Title	L	T	P/S	Credits
BSC 3	MTL BS102	Engineering Mathematics-II	3	1	0	4
BSC 4	BTL BS102	Biology for Engineers	3	1	0	4
DCC 1	CSL DC102	Programming using Python	3	0	0	3
DCC 1	CSP DC102	Python Programming Lab	0	0	2	1
DCC 2	CSL DC104	Data structure	3	0	0	3
DCC 2	CSP DC104	Data Structure Lab	0	0	2	1
SEC 2	MEM SE102	Engineering Workshop	1	0	2	2
AEC 2		Ability Enhancement Course				2
VAC 2		Value Added Course				2
MAC 1	PCN MA102	Universal Human Values - II	2	0	0	0
		Total Credits				**22**

Exit option: Students who opt to exit after completion of the year and have secured 42 credits (As per the program structure) shall be awarded the UG Certificate if, in addition, they earn additional 6 credits through 2 months of summer internship/ ITI level course/skill-based course during the summer vacation of the first year.

Semester III

Course Type	Course Code	Course Title	L	T	P/S	Credits
BSC 5	MTL BS201	Discrete Structures	3	0	0	3
ESC 3	ECL ES205	Microprocessors & Interfacing	3	0	0	3
ESC 3	ECP ES205	Microprocessors & Interfacing Lab	0	0	2	1
DCC 3	CSL DC201	Theory of Computation	3	1	0	4
DCC 4	CSL DC203	Operating Systems	3	0	0	3
DCC 4	CSP DC203	Operating Systems Lab	0	0	2	1
DCC 5	CSL DC205	Data Science & Analytics	3	0	0	3
DCC 5	CSP DC205	Data Science & Analytics Lab	0	0	2	1
SEC 3		Skill Enhancement Course - 3				2

PR	CSI PR201	Summer Internship-I				1
VAC 3	BTL VA202	Environmental Science & Education	2	0	0	2
		Total Credits				**24**

Semester IV

Course Type	Course Code	Course Title	L	T	P/S	Credits
DCC 6	CSL DC202	Soft Computing	3	0	0	3
DCC 6	CSP DC202	Soft Computing Lab	0	0	2	1
DCC 7	CSL DC204	Design & Algorithm Analysis	3	0	0	3
DCC 7	CSP DC204	Design & Algorithm Analysis Lab	0	0	2	1
DCC 8	CSL DC206	Database Management Systems	3	0	0	3
DCC 8	CSP DC206	Database Management Systems Lab	0	0	2	1
DCC 9	CSL DC208	Computer Organization & Architecture	3	1	0	4
DCC 10	CSL DC210	Compiler Design	3	1	0	4
VAC 4		Value Added Courses				2
		Total Credits				**22**

Exit option: Students who opt to exit after completion of the second year and have secured 88 credits (As per the program structure) shall be awarded the UG Diploma if, in addition, they earn an additional 6 credits through 2 months of summer internship/ Diploma level courses/skill vacation of the second year.

Semester V

Course Type	Course Code	Course Title	L	T	P/S	Credits
DCC 11	CSL DC301	Computer Networks & Communication	3	0	0	3
DCC 11	CSP DC301	Computer Networks & Communication Lab	0	0	2	1
DCC 12	CSL DC303	Object Oriented Programming using JAVA	3	0	0	3
DCC 12	CSP DC303	Object Oriented Programming Lab using JAVA	0	0	2	1
DCC 13	CSL DC305	Machine Learning	3	0	0	3
DCC 13	CSP DC305	Machine Learning Lab	0	0	2	1
DEC 01		School Elective – I	3	1/0	0/2	4
DEC 2 /GEC 1		School Elective – II/Generic Elective - I	3	1/0	0/2	4
PR	CSI PR301	Summer Internship-II				1
DCC	CSD PR301	Project Work – I				2
		Total Credits				**23**

Semester VI

Course Type	Course Code	Course Title	L	T	P/S	Credits
DCC 14	CSL DC302	Deep Learning	3	0	0	3
DCC 14	CSP DC302	Deep Learning Lab	0	0	2	1
DCC 15	CSL DC304	Software Engineering	3	0	0	3
DCC 15	CSP DC304	Software Engineering Lab	0	0	2	1
DEC 3	CSX DEXXX	School Elective – III	3	1/0	0/2	4
DEC 4 /GEC 2	CSX DEXXX / CSX GEXXX	School Elective – IV/Generic Elective -II	3	1/0	0/2	4
AEC		Management / Entrepreneurship/Economy	3	0	0	3
DCC	CSD PR302	Project Work – II				2
MAC 2	PCN MA302	Indian Knowledge System	2	0	0	NC
		Total Credits				**21**

Exit option: Students who opt to exit after completion of the third year and have secured 132 credits (As per the program structure) shall be awarded B.VOC Degree in the Major discipline if, in addition, they have completed the summer internship of additional 4 credits during summer vacation of the third year.

Semester VII

Course Type	Course Code	Course Title	L	T	P/S	Credits
DCC 16	CSL DC401	Digital Image Processing	3	0	0	3
DCC 16	CSP DC401	Digital Image Processing Lab	0	0	2	1
DEC 5	CSX DEXXX	School Elective – V	3	1/0	0/2	4
DEC 6 / GEC 3	CSX DEXXX / CSX GEXXX	School Elective – VI/ Generic Elective – III	3	1/0	0/2	4
PR	CSI PR401	Summer Internship - III				2
DCC/PR	CSD PR401	Project Work– III				4
		Total Credits				**18**

Internship to be completed in summer vacation after sixth semester.

Semester VIII

DCC/PR	CSD PR402/ CSI PR402	Major Project /Internship (Industrial or In-house Project)				10
		Total Credits	**160**			**10**

LIST OF SCHOOL ELECTIVE COURSES

List of School Electives For B.Tech. CSE						
S. No.	**Course Code**	**Course Title**	**L**	**T**	**P**	**C**
DEC – I						
1	CSL DE301	Software Defined Networks	3	0	2	4
2	CSL DE303	Storage Networks	3	1	0	4
3	CSL DE305	Computer Vision	3	1	0	4
4	CSE DE307	Web Programming	3	0	2	4
5	CSL DE309	Block Chain Technology	3	1	0	4
6	CSL DE311	Data Visualization **(Hon. DS & AI)**	3	0	2	4
DEC – II						
1	CSL DE313	Probability & Stochastic Processes **(Hon. DS & AI)**	3	1	0	4
2	CSL DE315	Cloud Computing	3	1	0	4
3	CSL DE317	Parallel & Distributed Computing	3	1	0	4
4	CSL DE319	Advanced Mobile Communication using 5G	3	1	0	4
5	CSL DE325	Advanced Computer Architecture	3	1	0	4
6	CSL DE323	Computer Network Security	3	0	2	4
DEC – III						
1	CSL DE302	Data mining & warehousing **(Hon. DS & AI)**	3	0	2	4
2	CSL DE304	Human Computer Interaction	3	1	0	4
3	CSL DE306	Quantum Computing	3	0	2	4
4	CSL DE308	Mobile & App Development	3	1	0	4
DEC – IV						
1	CSL DE322	Digital twin **(Hon. DS & AI)**	3	0	2	4
2	CSL DE310	Internet of Things **(Hon. DS & AI)**	3	1	0	4
3	CSL DE312	Wireless Networks	3	0	2	4
4	CSL DE314	Information Coding Practices	3	1	0	4
5	CSL DE316	Computer Embedded Systems	3	1	0	4
6	CSL DE318	Multimedia and Virtual Reality	3	1	0	4
7	CSL DE320	High Performance Computing	3	1	0	4
DEC – V						
1	CSL DE401	Nature Inspired Algorithms **(Hon. DS & AI)**	3	0	2	4
2	CSL DE411	Robotics & Vision Control **(Hon. DS & AI)**	3	1	0	4
3	CSL DE403	Metaheuristic Design Framework	3	1	0	4
4	CSL DE405	Cyber Security	3	1	0	4
5	CSL DE407	E-Commerce & Cyber Laws	3	1	0	4
6	CSL DE409	Digital Forensic	3	1	0	4
DEC – VI						
1	CSL DE413	Natural Language Processing **(Hon. DS & AI)**	3	1	0	4
2	CSL DE415	Foundation Models **(Hon. DS & AI)**	3	1	0	4

B.Tech. CSE Honors. in Data Science & Artificial Intelligence

Course Type	Course Code	Course Title	L	T	P/S	Credits
DEC	CSL DE311	Data Visualization	3	0	2	4
DEC	CSL DE313	Probability & Stochastic Processes	3	1	0	4
DEC	CSL DE302	Data mining & warehousing	3	0	2	4
DEC	CSL DE322	Digital twin	3	0	2	4
DEC	CSL DE310	Internet of Things	3	0	2	4
DEC	CSL DE401	Nature Inspired Algorithms	3	0	2	4
DEC	CSL DE411	Robotics & Vision Control	3	1	0	4
DEC	CSL DE413	Natural Language Processing	3	1	0	4
DEC	CSL DE415	Foundation Models	3	1	0	4
DEC	CSL DE315	Cloud Computing	3	0	2	4
DEC	CSL DE320	High Performance Computing	3	1	0	4
DEC	CSL DE321	Business Analytics with R	3	0	2	4

a) **Minor Specialization in Artificial Intelligence**
b) **Minor Specialization in Information Security**

	Minor Specialization in Artificial Intelligence				
Course Code	**Course Title**	**L**	**T**	**P/S**	**Credits**
CSL GE301	Introduction to Artificial Intelligence	3	1	0	4
CSL GE305	Probability & Statistics	3	1	0	4
CSL GE302	Introduction to Machine Learning	3	0	2	4
CSL GE306	Data Analytics	3	0	2	4
CSL GE401	Soft Computing	3	0	2	4
CSL GE405	Natural Language Processing	3	1	0	4
CSL GE402	Artificial Intelligence for Engineering Applications	3	1	0	4
CSL GE406	Prompt Engineering	3	1	0	4
CSL GE410	Vision Transformers	3	1	0	4

	Minor Specialization in Information Security				
Course Code	**Course Title**	**L**	**T**	**P/S**	**Credits**
CSL GE303	Computer Network & Communication	3	0	2	4
CSL GE307	Information & Coding Practices	3	1	0	4
CSL GE304	Wireless Networks	3	0	2	4
CSL GE308	Internet of Things	3	0	2	4
CSL GE403	Introduction to Cyber Security	3	1	0	4
CSL GE407	Block Chain Coding	3	1	0	4
CSL GE404	Privacy & Security in Online Social Media	3	1	0	4
CSL GE408	Information Response & Management	3	1	0	4

B. Tech. (Honor's) Program: The four-year B. Tech. (Honor's) degree in the Major discipline will be awarded to those who have completed the credit requirement of a four-year B.Tech. degree program and earned 12 Additional Credits through DEC's provided a minimum of seven DEC's earned are from the basket of a particular specialization/domain.
These elective courses can be registered during V to VIII semester subject to a maximum limit of course

registration up to 32 credits, including core and other courses.

Department Elective Course – 7	4	DEC
Department Elective Course – 8	4	DEC
Department Elective Course – 9	4	DEC

These elective courses can be registered during V to VIII semester subject to a maximum limit of course registration up to 32 credits, including core and other courses. On exit, student shall be awarded B.Tech.(Honor's) in Major discipline with specialization in the specific domain.

2. B. Tech. Program with Minor/Interdisciplinary Area Specialization:

The four-year B. Tech. degree in the Major discipline with Minor in a specific domain will be awarded to those who have completed the credit requirement of four-year B. Tech degree program and earned 12 Additional Credits through GECs provided all credits earned through GECs are from the basket of a particular Minor.

Generic Elective Course – 5	4	GEC
Generic Elective Course – 6	4	GEC
Generic Elective Course – 7	4	GEC

The set of courses required to be taken, by students of other School, to obtain Minor/Interdisciplinary Area Specialization will be clearly defined by each School for the benefit of the students. The four-year B. Tech. degree with Minor in a specific domain will be awarded to those who complete a four-year degree program with 172 credits and have satisfied the credit requirement. A student, who wishes to pursue B. Tech. with Minor, shall earn 12 additional credits from General Elective course provided all 7 GECs (GEC1 to GEC7) are earned from the basket of courses prescribed for that particular Minor.

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Annexure C

Proposed Course Structure for B. Tech(Computer Science & Engineering) Programme
[Entry Batch 2023 onwards]

Semester 1

Course Code	Course Title	L	T	P	C	Category
MTL BS101	Engineering Mathematics-I	3	1	0	4	BSC 1
ECL ES103	Digital Electronics	3	0	0	3	ESC 1
ECP ES103	Digital Electronics Lab	0	0	2	1	ESC 1
PHL BS101	Engineering Physics	3	0	0	3	BSC 2
PHP BS101	Engineering Physics Lab	0	0	2	1	BSC 2
CSL ES101	Introduction to 'C' Programming	3	0	0	3	ESC 2
CSP ES101	'C' Programming Lab	0	0	2	1	ESC 2
MEM SE103	Engineering Graphics with CAD	1	0	2	2	SEC 1
	AEC 1/VAC 1	2	0	0	2	AEC 1/VAC 1
	Total Credits	15	1	8	**20**	

Semester 2

Course Code	Course Title	L	T	P	C	Category
MTL BS102	Engineering Mathematics-II	3	1	0	4	BSC 3
BTL BS102	Biology for Engineers	3	1	0	4	BSC 4
CSL DC102	Programming using Python	3	0	0	3	DCC 1
CSP DC102	Python Programming Lab	0	0	2	1	DCC 1
CSL DC104	Data structure	3	0	0	3	DCC 2
CSP DC104	Data Structure Lab	0	0	2	1	DCC 2
MEM SE101	EngineeringWorkshop	1	0	2	2	SEC 2
	AEC 2	2	0	0	2	AEC 2
	VAC 2	2	0	0	2	VAC 2
PCLMA102	Universal Human Values - II	2	0	0	NC	MAC 1
	Total Credits	17	2	6	**22**	

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Semester 3

Course Code	Course Title	L	T	P	C	Category
	Introduction to Logic	2	0	0	2	VAC 3
CSL DC201	Theory of Computation	3	1	0	4	DCC 3
CSL SE201	Artificial Intelligence: Constraint Satisfaction Problems	2	0	0	2	SEC 3
	Discrete Structures	3	0	0	3	BSC 5
CSL DC203	Operating Systems	3	0	0	3	DCC 4
CSP DC203	Operating Systems Lab	0	0	2	1	DCC 4
	Microprocessors & Interfacing	3	0	0	3	ESC 3
	Microprocessors & Interfacing Lab	0	0	2	1	ESC 3
CSI PR201	Summer Internship-I	0	0	2	1	PR
CSL DC205	Data Science & Analytics	3	0	0	3	DCC 5
CSP DC205	Data Science & Analytics Lab	0	0	2	1	DCC 5
	Total Credits	19	1	8	**24**	

Semester 4

Course Code	Course Title	L	T	P	C	Category
	Value Added Course-4	2	0	0	2	VAC 4
	Environmental Science & Education	2	0	0	NC	MAC 2
CSL DC202	Soft Computing	3	0	0	3	DCC 6
CSP DC202	Soft Computing Lab	0	0	2	1	DCC 6
CSL DC204	Design & Algorithm Analysis	3	0	0	3	DCC 7
CSP DC204	Design & Algorithm Analysis Lab	0	0	2	1	DCC 7
CSL DC206	Database Management Systems	3	0	0	3	DCC 8
CSP DC206	Database Management Systems Lab	0	0	2	1	DCC 8
CSL DC208	Computer Organization & Architecture	3	1	0	4	DCC 9
CSL DC210	Compiler Design	3	1	0	4	DCC 10
	Total Credits				**22**	

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Semester 5

Course Code	Course Title	L	T	P	C	Category
CSL DE3XX	School Elective – I	4	0	0	4	DEC- 1
	School Elective – II/Generic Elective -I	4	0	0	4	DEC-2 /GEC-1
CSL DC301	Computer Networks & Communication	3	0	0	3	DCC 11
CSP DC301	Computer Networks & Communication Lab	0	0	2	1	DCC 11
CSL DC303	Object Oriented Programming using JAVA	3	0	0	3	DCC 12
CSP DC303	Object Oriented Programming Lab using JAVA	0	0	2	1	DCC 12
CSL DC305	Machine Learning	3	0	0	3	DCC 13
CSP DC305	Machine Learning Lab	0	0	2	1	DCC 13
CSI PR301	Summer Internship-II	0	0	2	1	PR
CSD PR301	Project Work - I	0	0	4	2	DCC
	Total Credits				23	

Semester 6

Course Code	Course Title	L	T	P	C	Category
CSL DE3XX	School Elective - III	4	0	0	4	DEC-3
CSL DE3XX	School Elective – IV/Generic Elective -II	4	0	0	4	DEC-4 /GEC-2
	Management Course/ Entrepreneurship/Economy	3	0	0	3	AEC (compulsory)
CSL DC302	Deep Learning	3	0	0	3	DCC 14
CSP DC302	Deep Learning Lab	0	0	2	1	DCC 14
CSL DC304	Software Engineering	3	0	0	3	DCC 15
CSP DC304	Software Engineering Lab	0	0	2	1	DCC 15
CSD PR302	Project Work - II	0	0	4	2	DCC
	Indian Knowledge System	2	0	0	NC	MAC 3
CSS PR302	Comprehensive Exam	0	0	0	NC	
	Total Credits				21	

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Semester 7

Course Code	Course Title	L	T	P	C	Category
CSD PR401	Project Work - III	0	0	8	4	DCC
CSI PR401	Summer Internship - III	0	0	4	2	PR
CSL DE4XX	School Elective – V	4	0	0	4	DEC-5
CSL DE4XX	School Elective – VI/ Generic Elective – III	4	0	0	4	DEC-6 /GEC-3
CSL DC401	Digital Image Processing	3	0	0	3	DCC 16
CSP DC401	Digital Image Processing Lab	0	0	2	1	DCC 16
	Total Credits				**18**	

*Internship to be completed in summer vacation after sixth semester.

Semester 8

Course Code	Course Title	L	T	P	C	Category
CSD PR402/ CSI PR402	Major Project /Internship(Industrial orIn-house Project)	0	0	14	7	DCC/PR
	Generic Elective-IV/NPTEL	3	0	0	3	GEC-4
	Total Credits	3	0	14	**10**	
	Total Credits (B.Tech)				**160**	

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LIST OF DEPARTMENT ELECTIVE COURSES

***As per AICTE guidelines, the following three subjects have been included in list of DEC's.**

1. Advanced Mobile Communication using 5G,
2. Internet of Things,
3. Cyber Security

LIST OF PROGRAM ELECTIVES (Theory Based)						
S. No.	Course Code	Course Title	L	T	P	C
		DEC – I				
1	CSL DE301	Software Defined Networking	3	0	2	4
2	CSL DE303	Storage Networks	4	0	0	4
3	CSL DE305	Computer Vision	4	0	0	4
4	CSE DE307	Web Programming using JavaScript	3	0	2	4
5	CSL DE309	Data mining & warehousing	3	0	2	4
6	CSL DE311	Block Chain Technology	4	0	0	4
		DEC – II				
1	CSL DE302	Cloud Computing	4	0	0	4
2	CSL DE304	Parallel & Distributed Computing	4	0	0	4
3	CSL DE306	Advanced Mobile Communication using 5G	4	0	0	4
4	CSL DE308	Advanced Computer Architecture	4	0	0	4
5	CSL DE310	Computer Network Security	4	0	0	4
6	CSL DE312	Probability & Stochastic Processes	4	0	0	4
		DEC – III				
1	CSL DE314	Internet of Things	4	0	0	4
2	CSL DE316	Human Computer Interaction	4	0	0	4
3	CSL DE318	Quantum Computing	3	0	2	4
4	CSL DE320	Nature Inspired Algorithms	4	0	0	4
5	CSL DE322	Mobile & App Development	4	0	0	4
		DEC – IV				
1	CSL DE401	Wireless Networks	4	0	0	4
2	CSL DE403	Information Coding Practices	4	0	0	4
3	CSL DE405	Computer Embedded Systems	4	0	0	4
4	CSL DE407	Multimedia and Virtual Reality	4	0	0	4
5	CSL DE409	High Performance Computing	4	0	0	4
		DEC – V				
1	CSL DE411	Metaheuristic Design Framework	4	0	0	4
2	CSL DE413	Cyber Security	4	0	0	4
3	CSL DE415	E-Commerce & Cyber Laws	4	0	0	4
4	CSL DE417	Digital Forensic	4	0	0	4
5	CSL DE419	Robotics & Vision Control	4	0	0	4

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Dated: 20.2.25

Annexure "D"

List of School Electives For B.Tech. CSE						
S. No.	**Course Code**	**Course Title**	**L**	**T**	**P**	**C**
DEC – I						
1	CSL DE301	Software Defined Networks	3	0	2	4
2	CSL DE303	Storage Networks	3	1	0	4
3	CSL DE305	Computer Vision	3	1	0	4
4	CSE DE307	Web Programming	3	0	2	4
5	CSL DE309	Block Chain Technology	3	1	0	4
6	CSL DE311	Data Visualization **(Hon. DS & AI)**	3	0	2	4
DEC – II						
1	CSL DE313	Probability & Stochastic Processes **(Hon. DS & AI)**	3	1	0	4
2	CSL DE315	Cloud Computing	3	1	0	4
3	CSL DE317	Parallel & Distributed Computing	3	1	0	4
4	CSL DE319	Advanced Mobile Communication using 5G	3	1	0	4
5	CSL DE325	Advanced Computer Architecture	3	1	0	4
6	CSL DE323	Computer Network Security	3	0	2	4
DEC – III						
1	CSL DE302	Data mining & warehousing **(Hon. DS & AI)**	3	0	2	4
2	CSL DE304	Human Computer Interaction	3	1	0	4
3	CSL DE306	Quantum Computing	3	0	2	4
4	CSL DE308	Mobile & App Development	3	1	0	4
DEC – IV						
1	CSL DE322	Digital twin **(Hon. DS & AI)**	3	0	2	4
2	CSL DE310	Internet of Things **(Hon. DS & AI)**	3	1	0	4
3	CSL DE312	Wireless Networks	3	0	2	4
4	CSL DE314	Information Coding Practices	3	1	0	4
5	CSL DE316	Computer Embedded Systems	3	1	0	4
6	CSL DE318	Multimedia and Virtual Reality	3	1	0	4
7	CSL DE320	High Performance Computing	3	1	0	4
DEC – V						
1	CSL DE401	Nature Inspired Algorithms **(Hon. DS & AI)**	3	0	2	4
2	CSL DE411	Robotics & Vision Control **(Hon. DS & AI)**	3	1	0	4
3	CSL DE403	Metaheuristic Design Framework	3	1	0	4
4	CSL DE405	Cyber Security	3	1	0	4
5	CSL DE407	E-Commerce & Cyber Laws	3	1	0	4
6	CSL DE409	Digital Forensic	3	1	0	4
DEC – VI						
1	CSL DE413	Natural Language Processing **(Hon. DS & AI)**	3	1	0	4
2	CSL DE415	Foundation Models **(Hon. DS & AI)**				

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Dated: 20.2.25

Annexure "E"

Course Structure of
B. Tech (Computer Science & Engineering) programme
[w.e.f Entry Batch 2024]

Semester I

Course Type	Course Code	Course Title	L	T	P/S	Credits
BSC 1	MTL BS101	Engineering Mathematics-I	3	1	0	4
BSC 2	PHL BS101	Engineering Physics	3	0	0	3
BSC 2	PHP BS101	Engineering Physics Lab	0	0	2	1
ESC 1	CSL ES101	Introduction to C Programming	3	0	0	3
ESC 1	CSP ES101	C Programming Lab	0	0	2	1
ESC 2	ECL ES103	Digital Electronics	3	0	0	3
ESC 2	ECP ES103	Digital Electronics Lab	0	0	2	1
SEC 1	MEM SE103	Engineering Graphics with CAD	1	0	2	2
AEC 1 / VAC 1		Ability Enhancement /Value Added Course				2
		Total Credits				**20**

Semester II

Course Type	Course Code	Course Title	L	T	P/S	Credits
BSC 3	MTL BS102	Engineering Mathematics-II	3	1	0	4
BSC 4	MTL BS106	Discrete Structures	3	1	0	4
DCC 1	CSL DC102	Programming using Python	3	0	0	3
DCC 1	CSP DC102	Python Programming Lab	0	0	2	1
DCC 2	CSL DC104	Data structure	3	0	0	3
DCC 2	CSP DC104	Data Structure Lab	0	0	2	1
SEC 2	MEM SE102	Engineering Workshop	1	0	2	2
AEC 2		Ability Enhancement Course				2
VAC 2		Value Added Course				2
MAC 1	PCN MA102	Universal Human Values - II	2	0	0	0
		Total Credits				**22**

Exit option: Students who opt to exit after completion of the year and have secured 42 credits (As per the program structure) shall be awarded the UG Certificate if, in addition, they earn additional 6 credits through 2 months of summer internship/ ITI level course/skill-based course during the summer vacation of the first year.

Semester III

Course Type	Course Code	Course Title	L	T	P/S	Credits
BSC 5	BTL BS201	Introduction to Biology for Engineers	3	0	0	3
ESC 3	ECL ES205	Microprocessors & Interfacing	3	0	0	3
ESC 3	ECP ES205	Microprocessors & Interfacing Lab	0	0	2	1
DCC 3	CSL DC201	Theory of Computation	3	1	0	4
DCC 4	CSL DC203	Operating Systems	3	0	0	3
DCC 4	CSP DC203	Operating Systems Lab	0	0	2	1
DCC 5	CSL DC205	Data Science & Analytics	3	0	0	3
DCC 5	CSP DC205	Data Science & Analytics Lab	0	0	2	1
SEC 3		Skill Enhancement Course - 3				2
PR	CSI PR201	Summer Internship-I				1
VAC 3		Value Added Course				2
		Total Credits				**24**

Semester IV

Course Type	Course Code	Course Title	L	T	P/S	Credits
DCC 6	CSL DC202	Soft Computing	3	0	0	3
DCC 6	CSP DC202	Soft Computing Lab	0	0	2	1
DCC 7	CSL DC204	Design & Algorithm Analysis	3	0	0	3
DCC 7	CSP DC204	Design & Algorithm Analysis Lab	0	0	2	1
DCC 8	CSL DC206	Database Management Systems	3	0	0	3
DCC 8	CSP DC206	Database Management Systems Lab	0	0	2	1
DCC 9	CSL DC208	Computer Organization & Architecture	3	1	0	4
DCC 10	CSL DC210	Compiler Design	3	1	0	4
VAC 4	BTL VA202	Environmental Science & Education	2	0	0	2
		Total Credits				**22**

Exit option: Students who opt to exit after completion of the secondcomputer year and have secured 88 credits (As per the program structure) shall be awarded the UG Diploma if, in addition, they earn an additional 6 credits through 2 months of summer internship/ Diploma level courses/skill vacation of the second year.

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Semester V

Course Type	Course Code	Course Title	L	T	P/S	Credits
DCC 11	CSL DC301	Computer Networks & Communication	3	0	0	3
DCC 11	CSP DC301	Computer Networks & Communication Lab	0	0	2	1
DCC 12	CSL DC303	Object Oriented Programming using JAVA	3	0	0	3
DCC 12	CSP DC303	Object Oriented Programming Lab using JAVA	0	0	2	1
DCC 13	CSL DC305	Machine Learning	3	0	0	3
DCC 13	CSP DC305	Machine Learning Lab	0	0	2	1
DEC 01		School Elective – I	3	1/0	0/2	4
DEC 2 /GEC 1		School Elective – II/Generic Elective - I	3	1/0	0/2	4
PR	CSI PR301	Summer Internship-II				1
DCC	CSD PR301	Project Work - I				2
		Total Credits				**23**

Semester VI

Course Type	Course Code	Course Title	L	T	P/S	Credits
DCC 14	CSL DC302	Deep Learning	3	0	0	3
DCC 14	CSP DC302	Deep Learning Lab	0	0	2	1
DCC 15	CSL DC304	Software Engineering	3	0	0	3
DCC 15	CSP DC304	Software Engineering Lab	0	0	2	1
DEC 3	CSX DEXXX	School Elective - III	3	1/0	0/2	4
DEC 4 /GEC 2	CSX DEXXX / CSX GEXXX	School Elective – IV/Generic Elective -II	3	1/0	0/2	4
AEC		Management / Entrepreneurship/Economy	3	0	0	3
DCC	CSD PR302	Project Work - II				2
MAC 2	PCN MA302	Indian Knowledge System	2	0	0	NC
		Total Credits				**21**

Exit option: Students who opt to exit after completion of the third year and have secured 132 credits (As per the program structure) shall be awarded B.VOC Degree in the Major discipline if, in addition, they have completed the summer internship of additional 4 credits during summer vacation of the third year.

Semester VII

Course Type	Course Code	Course Title	L	T	P/S	Credits
DCC 16	CSL DC401	Digital Image Processing	3	0	0	3
DCC 16	CSP DC401	Digital Image Processing Lab	0	0	2	1
DEC 5	CSX DEXXX	School Elective – V	3	1/0	0/2	4
DEC 6 / GEC 3	CSX DEXXX / CSX GEXXX	School Elective – VI/ Generic Elective – III	3	1/0	0/2	4
PR	CSI PR401	Summer Internship - III				2
DCC/PR	CSD PR401	Project Work– III				4
		Total Credits				**18**

Internship to be completed in summer vacation after sixth semester.

Semester VIII

DCC/PR	CSD PR402/ CSI PR402	Major Project /Internship (Industrial or In-house Project)				10
		Total Credits	**160**			**10**

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Shri Mata Vaishno Devi University

School of Computer Science and Engineering

Faculty of Engineering, SMVDU

Kakryal, Katra 182320

LIST OF SCHOOL ELECTIVE COURSES

List of School Electives For B.Tech. CSE						
S. No.	**Course Code**	**Course Title**	**L**	**T**	**P**	**C**
		DEC – I				
1	CSL DE301	Software Defined Networks	3	0	2	4
2	CSL DE303	Storage Networks	3	1	0	4
3	CSL DE305	Computer Vision	3	1	0	4
4	CSE DE307	Web Programming	3	0	2	4
5	CSL DE309	Block Chain Technology	3	1	0	4
6	CSL DE311	Data Visualization **(Hon. DS & AI)**	3	0	2	4
		DEC – II				
1	CSL DE313	Probability & Stochastic Processes **(Hon. DS & AI)**	3	1	0	4
2	CSL DE315	Cloud Computing	3	1	0	4
3	CSL DE317	Parallel & Distributed Computing	3	1	0	4
4	CSL DE319	Advanced Mobile Communication using 5G	3	1	0	4
5	CSL DE325	Advanced Computer Architecture	3	1	0	4
6	CSL DE323	Computer Network Security	3	0	2	4
		DEC – III				
1	CSL DE302	Data mining & warehousing **(Hon. DS & AI)**	3	0	2	4
2	CSL DE304	Human Computer Interaction	3	1	0	4
3	CSL DE306	Quantum Computing	3	0	2	4
4	CSL DE308	Mobile & App Development	3	1	0	4
		DEC – IV				
1	CSL DE322	Digital twin **(Hon. DS & AI)**	3	0	2	4
2	CSL DE310	Internet of Things **(Hon. DS & AI)**	3	1	0	4
3	CSL DE312	Wireless Networks	3	0	2	4
4	CSL DE314	Information Coding Practices	3	1	0	4
5	CSL DE316	Computer Embedded Systems	3	1	0	4
6	CSL DE318	Multimedia and Virtual Reality	3	1	0	4
7	CSL DE320	High Performance Computing	3	1	0	4
		DEC – V				
1	CSL DE401	Nature Inspired Algorithms **(Hon. DS & AI)**	3	0	2	4
2	CSL DE411	Robotics & Vision Control **(Hon. DS & AI)**	3	1	0	4
3	CSL DE403	Metaheuristic Design Framework	3	1	0	4
4	CSL DE405	Cyber Security	3	1	0	4
5	CSL DE407	E-Commerce & Cyber Laws	3	1	0	4
6	CSL DE409	Digital Forensic	3	1	0	4
		DEC – VI				
1	CSL DE413	Natural Language Processing **(Hon. DS & AI)**	3	1	0	4
2	CSL DE415	Foundation Models **(Hon. DS & AI)**	3	1	0	4

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B.Tech. CSE Honors. in Data Science & Artificial Intelligence

Course Type	Course Code	Course Title	L	T	P/S	Credits
DEC	CSL DE311	Data Visualization	3	0	2	4
DEC	CSL DE313	Probability & Stochastic Processes	3	1	0	4
DEC	CSL DE302	Data mining & warehousing	3	0	2	4
DEC	CSL DE322	Digital twin	3	0	2	4
DEC	CSL DE310	Internet of Things	3	0	2	4
DEC	CSL DE401	Nature Inspired Algorithms	3	0	2	4
DEC	CSL DE411	Robotics & Vision Control	3	1	0	4
DEC	CSL DE413	Natural Language Processing	3	1	0	4
DEC	CSL DE415	Foundation Models	3	1	0	4
DEC	CSL DE315	Cloud Computing	3	0	2	4
DEC	CSL DE320	High Performance Computing	3	1	0	4
DEC	CSL DE321	Business Analytics with R	3	0	2	4

a) **Minor Specialization in Artificial Intelligence**
b) **Minor Specialization in Information Security**

	Minor Specialization in Artificial Intelligence				
Course Code	**Course Title**	**L**	**T**	**P/S**	**Credits**
CSL GE301	Introduction to Artificial Intelligence	3	1	0	4
CSL GE305	Probability & Statistics	3	1	0	4
CSL GE302	Introduction to Machine Learning	3	0	2	4
CSL GE306	Data Analytics	3	0	2	4
CSL GE401	Soft Computing	3	0	2	4
CSL GE405	Natural Language Processing	3	1	0	4
CSL GE402	Artificial Intelligence for Engineering Applications	3	1	0	4
CSL GE406	Prompt Engineering	3	1	0	4
CSL GE410	Vision Transformers	3	1	0	4

	Minor Specialization in Information Security				
Course Code	**Course Title**	**L**	**T**	**P/S**	**Credits**
CSL GE303	Computer Network & Communication	3	0	2	4
CSL GE307	Information & Coding Practices	3	1	0	4
CSL GE304	Wireless Networks	3	0	2	4
CSL GE308	Internet of Things	3	0	2	4
CSL GE403	Introduction to Cyber Security	3	1	0	4
CSL GE407	Block Chain Coding	3	1	0	4
CSL GE404	Privacy & Security in Online Social Media	3	1	0	4
CSL GE408	Information Response & Management	3	1	0	4

B. Tech. (Honor's) Program: The four-year B. Tech. (Honor's) degree in the Major discipline will be awarded to those who have completed the credit requirement of a four-year B.Tech. degree program and earned 12 Additional Credits through DEC's provided a minimum of seven DEC's earned are from the basket of a particular specialization/domain.
These elective courses can be registered during V to VIII semester subject to a maximum limit of course

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registration up to 32 credits, including core and other courses.

Department Elective Course – 7	4	DEC
Department Elective Course – 8	4	DEC
Department Elective Course – 9	4	DEC

These elective courses can be registered during V to VIII semester subject to a maximum limit of course registration up to 32 credits, including core and other courses. On exit, student shall be awarded B.Tech.(Honor's) in Major discipline with specialization in the specific domain.

2. **B. Tech. Program with Minor/Interdisciplinary Area Specialization:**

The four-year B. Tech. degree in the Major discipline with Minor in a specific domain will be awarded to those who have completed the credit requirement of four-year B. Tech degree program and earned 12 Additional Credits through GECs provided all credits earned through GECs are from the basket of a particular Minor.

Generic Elective Course – 5	4	GEC
Generic Elective Course – 6	4	GEC
Generic Elective Course – 7	4	GEC

The set of courses required to be taken, by students of other School, to obtain Minor/Interdisciplinary Area Specialization will be clearly defined by each School for the benefit of the students. The four-year B. Tech. degree with Minor in a specific domain will be awarded to those who complete a four-year degree program with 172 credits and have satisfied the credit requirement. A student, who wishes to pursue B. Tech. with Minor, shall earn 12 additional credits from General Elective course provided all 7 GECs (GEC1 to GEC7) are earned from the basket of courses prescribed for that particular Minor.

Annexure "F"

Course Code	**: CSL DE301**
Course Title	**: Software Defined Networks**
L-T-P/S=Credits	**: 3-0-2**

UNIT I
Introduction to Traditional networks: Traditional networks, Control Plane, Data Plane and Management Plane , Flow table, Limitations of traditional networks- Need for simplification, Lowering operating costs ,Single flow table, Flexibility issues, Proprietary protocols and Destination based forwarding. ,ForCES .

UNIT II
Introduction to SDN: Software defined networks, SDN Planes-Dataplane, Control Plane, Application Plane, OpenFlow, Open Network Foundation, Protocol-Encryption, Northbound & SouthboundAPI, Multi-level flow table and pipeline processing, Group table, Meter table-Meter bands, OpenFlow version- 1.0,1.1,1.2,1.3

UNIT III
SDN Messages and Table matching: Messages-Controller-Switch, Symmetric & Asynchronous messages Counters, OpenFlow Ports, Table matching in SDN, Network Automation and Virtualization.

UNIT IV
Mininet Emulator: Introduction to Mininet, Custom topologies of OpenFlow and Legacy Networks, Flow table manipulation-Adding & Deleting Flow entries, Packet Dissection via Wireshark

UNIT V
SDN Applications and Use Cases: SDN Controllers-Ryu, POX, Floodlight, SDN Applications, SDNUseCases, SDN in the DataCenter and WAN, SDN-OpenSource and its Features

List of Experiments:

Lab 1: Introduction to Mininet and Cloudlab
Lab 2: Legacy Metqorks: BGP Example as a Distributed System and Autonomous
Lab 3: Early efforts of SDN: MPLS Example of a Control Plane that Establishes Semi-static Forwarding Paths
Lab 4: Introduction to SDN, SDN Network Configurationbr
Lab 5: Configuring VXLAN to provide Network Traffic Isolation, Configuring VXLAN
Lab 6: Introduction to Openflow, OpenFlow Protocol Management
Lab 7: Routing within a SDN network
Lab 8: Interconnection between Legacy Networks and SDN Networks, Incremental Deployment of SDN Networks within legacy Networks
Lab 9: Configuring Virtual Private LAN Service(VPLS)
Lab 10: Applying Equal-cost Multi-path Protocol (ECMP) within SDN networks

Course Outcomes:
1. Understand the difference between traditional Networks and SDN
2. Understand the design principles and performance enhancement strategies that adopted in performance evolution of different network components
3. Able to solve the performance related problems of SDN, including those in routing, optimizing traffic engineering.
4. Able to analyze the performance of routing, optimizing traffic engineering using SDN

Suggested Books:

- Nadeau, Thomas D., and Ken Gray. SDN: Software Defined Networks: an authoritative review of network programmability technologies. " O'Reilly Media, Inc.", 2013.
- Chuck Black and Paul Goransson, " Software Defined Networks: A Comprehensive Approach", Morgan Kaufman.
- Coker, Oswald, and Siamak Azodolmolky. Software-defined Networking with OpenFlow: Deliver Innovative Business Solutions. Packt Publishing Ltd, 2017

Course Code : **CSL DE311**
Course Title : **Data Visualization**
L-T-P/S=Credits : **3-0-2**

UNIT I
Introduction: Context of data visualization – Definition, Methodology, Visualization design objectives. Key Factors – Purpose, visualization function and tone, visualization design options – Data representation, Data Presentation, Seven stages of data visualization, widgets, data visualization tools. Mapping - Time Series - Connections and Correlations - Scatterplot Maps - Trees, Hierarchies, and Recursion - Networks and Graphs

UNIT II
Visualization Techniques For Time-Series, Trees & Graphs: Mapping - Time series - Connections and correlations – Indicator-Area chart-Pivot table Scatter charts, Scatter maps - Tree maps, Space filling and non-space filling methods, Hierarchies and Recursion - Networks and Graphs-Displaying Arbitrary Graphs-node link graph-Matrix representation for graphs- Info graphics

UNIT III
Text And Document Visualization: Acquiring data, - Where to Find Data, Tools for Acquiring Data from the Internet, Locating Files for Use with Processing, Loading Text Data, Dealing with Files and Folders, Listing Files in a Folder ,Asynchronous Image Downloads, Web Techniques, Parsing data - Levels of Effort, Tools for Gathering Clues, Text Markup Languages, Regular Expressions, Grammars and BNF Notation, Compressed Data, Vectors and Geometry, Binary Data Formats, Advanced Detective Work.

UNIT IV
Interactive Data Visualization: Drawing with data – Scales – Axes – Updates, Transition and Motion – Interactivity - Layouts – Geomapping – Exporting, Framework – D3.js, Tableau Dashboards.

UNIT V
Security In Data Visualization: Port scan visualization - Vulnerability assessment and exploitation - Firewall log visualization - Intrusion detection log visualization -Attacking and defending visualization systems – Creating secured visualization system.

List of Experiments:
1. Introduction to various Data Visualization tools
2. Basic Visualization in Python
3. Basic Visualization in R
4. Introduction to Tableau and Installation
5. Connecting to Data and preparing data for visualization in Tableau
6. Data Aggregation and Statistical functions in Tableau
7. Data Visualizations in Tableau
8. Basic Dashboards in Tableau

Course Outcomes:
1. Apply mathematics and basic science knowledge for designing information visualizing System.
2. Collect data ethically and solve engineering problem in visualizing the information.
3. Implement algorithms and techniques for interactive information visualization.
4. Analyze and design system to visualize multidisciplinary multivariate Data individually or in teams.

Suggested Books:

1. Robert Spence, "Information Visualization An Introduction", Third Edition, Pearson Education, 2014.
2. Colin Ware, "Information Visualization Perception for Design", Third edition, Margon Kaufmann Publishers, 2012.
3. Matthew O. Ward, George Grinstein, Daniel Keim, "Interactive Data Visualization: Foundation, Techniques and Applications", Second Edition, A. K. Peters/CRC Press, 2015.
4. Joerg Osarek, "Virtual Reality Analytics", Gordon's Arcade, 2016.

Course Code : **CSL DE302**
Course Title : **Data mining & Warehousing**
L-T-P/S=Credits : **3-0-2**

UNIT I
Data Warehousing and Business Analysis: - Data warehousing Components –Building a Data warehouse –Data Warehouse Architecture – DBMS Schemas for Decision Support – Data Extraction, Cleanup, and Transformation

Tools –Metadata – reporting – Query tools and Applications – Online Analytical Processing (OLAP) – OLAP and Multidimensional Data Analysis.

UNIT II

Data Mining: - Data Mining Functionalities – Data Preprocessing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization and Concept Hierarchy Generation- Architecture Of A Typical Data Mining Systems- Classification Of Data Mining Systems.
Association Rule Mining: - Efficient and Scalable Frequent Item set Mining Methods – Mining Various Kinds of Association Rules – Association Mining to Correlation Analysis – Constraint-Based Association Mining.

UNIT III

Classification and Prediction: - Issues Regarding Classification and Prediction – Classification by Decision Tree Introduction – Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Prediction – Accuracy and Error Measures – Evaluating the Accuracy of a Classifier or Predictor – Ensemble Methods – Model Section.

UNIT IV

Cluster Analysis: - Types of Data in Cluster Analysis – A Categorization of Major Clustering Methods – Partitioning Methods – Hierarchical methods – Density-Based Methods – Grid-Based Methods – Model-Based Clustering Methods – Clustering High-Dimensional Data – Constraint-Based Cluster Analysis – Outlier Analysis.

UNIT V

Mining Object, Spatial, Multimedia, Text and Web Data: Multidimensional Analysis and Descriptive Mining of Complex Data Objects – Spatial Data Mining – Multimedia Data Mining – Text Mining – Mining the World Wide Web.

List of Experiments:

1. Experiments related to file format for data mining
2. Experiments related to conversion of various data files
3. Experiments related to Training the given dataset for an application
4. Testing the given dataset for an application
5. Generating accurate models
6. Data pre-processing – data filters
7. Experiments related to Feature selection
8. Experiments related to Web mining
9. Experiments related to Text mining
10. Design of fact & dimension tables
11. Generating graphs for star schema.

Course Outcomes:

5. To be familiar with the Data warehouse architecture and its Implementation.
6. To know the Architecture of a Data Mining system.
7. To understand the various Data preprocessing Methods.
8. To perform classification and prediction of data.

Suggested Books:

5. Jiawei Han, Micheline Kamber and Jian Pei"Data Mining Concepts and Techniques", Third Edition, Elsevier, 2011.
6. Alex Berson and Stephen J. Smith "Data Warehousing, Data Mining & OLAP", Tata McGraw – Hill Edition, Tenth Reprint 2007.
7. K.P. Soman, Shyam Diwakar and V. Ajay "Insight into Data mining Theory and Practice", Easter Economy Edition, Prentice Hall of India, 2006.
8. G. K. Gupta "Introduction to Data Mining with Case Studies", Easter Economy Edition, Prentice Hall of India, 2006.
9. Pang-Ning Tan, Michael Steinbach and Vipin Kumar "Introduction to Data Mining", Pearson Education, 2007.

Course Code : **CSL DE310**
Course Title : **Internet of Things**
L-T-P/S=Credits : **3-0-2**

Syllabus

Introduction: Definition of Internet of Things: Life in IoT ecosystem Characteristics of IoTIoT components Pillars of IoTIoT Design goals Applications of IoT Why IoT Examples of IoT ecosystem Definition of THINGS, examples of things

IoT Protocol Stack : IoT protocol stack layers physical or sensor layer processing and control action layer hardware interface layer RF layer session / message layer user experience layer application layer Sensor Networks Design principles of connected devices IoT Architecture Reference Models Physical design of IoT Logical design of IoT

IoT enabling technologies : Wireless sensor networks Sensing & Actuation cloud computing IaaS PaaS SaaS Fog layer Role of fog layer in IoT eco system big data analysis embedded systems security protocols and architecture Communication protocols web services microcontrollers and their interface to sensors ARM microcontroller

Protocols for IoT :Addressing and identification IP address IPV4 IPV6 address formats embedding IPV4 into IPV6 neighbour discovery in IPV6 IPV6 packet IPV6 frame format IPV6 extension header. Low power wide area networking Domain specific IoT, Routing protocol RPL low power and lossy networks, IoT and M2M (Machine-to-Machine) communication, Interoperability in IoT

Messaging in IoT : Message queuing telemetry transport (MQTT) architecture of MQTT MQTT message format publish- subscribe architecture in MQTT client and broker architecture MQTT broker constrained application protocol (CoAP) CoAP architecture CoAP messages CoAP request / response model HTTP vs MQTT /CoAP

IoT communication modules : Bluetooth Bluetooth low energy (BLE) BLE over Bluetooth BLE features BLE components BLE protocol stack IEEE 802.15.X architecture of LR-WPAN 6LoWPAN Zigbee Wireless HART RFD FFD IEEE 802.15.4 network topologies Link quality indication clear channel assessment

IoT security security threats in governing IoT routing attacks, privacy and security issues, governing IoT, issues approaches and new paradigms, steps towards a secure platform, data aggregation and security for IoT applications in smart cities

List of Experiments

1. Study of aurdino board
2. Interfacing Aurdino board with light sensor
3. LED Blinking code
4. LDR sensor detecting light sensitivity
5. Temperature recording of particular location Traffic Light system
6. Implement humidity recording Smart irrigation system
7. Smart doorbell system
8. Home automation System
9. Smart street light System
10. Smart locking System
11. IoT weather reporting system
12. Surveillance alarm
13. Water overflow alarm
14. Motion detection alarm
15. Study of raspberry pi

Course Outcomes

CO1: The students will be thorough about the technology behind the IoT and associated technologies
CO2: The students will be able to use the IoT technologies in real life like design of smart city, smart agriculture etc.
CO3: The students will be able to gain knowledge about the state of the art methodologies in IoT application domains.
CO4 : The students will be able to use the sensors for data collection, use the communication technologies for data transmission, and analyze the data for various applications.
CO5 : The students will learn to do the performance analysis of the protocols like efficiency, throughput, delay, packet delivery ratio etc during data transmission.

Text Books:

1. Rajkumar Buyaa and Amir V Dastjerdi, *Internet of things: Principles and Paradigms*, Morgan Kaufmann
2. A Bahga & V Madisetti, *Internet of Things: A Hands On Approach*, Universities Press
3. Adrian McEwen and Hakim Cassimally, *Designing the Internet of Things*, Wiley
4. Olivier Hersent, David Boswarthick and Omar Elloumi, *The Internet of Things: Key applications and Protocols*, Wiley

Course Code	**: CSL DE312**
Course Title	**: Wireless Networks**
L-T-P/S=Credits	**: 3-0-2**

Syllabus

UNIT I : WIRELESS LAN
Introduction-WLAN technologies: - IEEE802.11: System architecture, protocol architecture, 802.11b, 802.11a – Hiper LAN: WATM, BRAN, HiperLAN2 – Bluetooth: Architecture, WPAN – IEEE 802.15.4, Wireless USB, Zigbee, 6LoWPAN, WirelessHART

UNIT II MOBILE NETWORK LAYER
Introduction - Mobile IP: IP packet delivery, Agent discovery, tunneling and encapsulation, IPV6-Network layer in the internet- Mobile IP session initiation protocol - mobile ad-hoc network: Routing: Destination Sequence distance vector, IoT: CoAP

UNIT III 3G OVERVIEW
Overview of UTMS Terrestrial Radio access network-UMTS Core network Architecture: 3GPP Architecture, User equipment, CDMA2000 overview- Radio and Network components, Network structure, Radio Network, TD-CDMA, TD – SCDMA.

UNIT IV INTERNETWORKING BETWEEN WLANS AND WWANS
Internetworking objectives and requirements, Schemes to connect WLANS and 3G Networks, Session Mobility, Internetworking Architecture for WLAN and GPRS, System Description, Local Multipoint Distribution Service, Multichannel Multipoint Distribution System.

UNIT V 4G & BEYOND
Introduction – 4G vision – 4G features and challenges - Applications of 4G – 4G Technologies: Multicarrier Modulation, Smart antenna techniques, IMS Architecture, LTE, Advanced Broadband Wireless Access and Services, MVNO.

LIST OF EXPERIMENTS SIMULATION USING MATLAB
1. 5G-Compliant waveform generation and testing
2. Modelling of 5G Synchronization signal blocks and bursts
3. Channel Modelling in 5G networks
4. Multiband OFDM demodulation
5. Perfect Channel estimation
6. Development of 5g New Radio Polar Coding

Course Outcomes:
CO1: To study the evolving wireless technologies and standards
CO2: To understand the architectures of various access technologies such as 3G, 4G, WiFi etc.
CO3: To understand various protocols and services provided by next generation networks

TEXT BOOKS:
1. Jochen Schiller, "Mobile Communications", Second Edition, Pearson Education 2012.(Unit I,II,III)
2. Vijay Garg, "Wireless Communications and networking", First Edition, Elsevier 2007.(Unit IV,V)

REFERENCES:
1. Erik Dahlman, Stefan Parkvall, Johan Skold and Per Beming, "3G Evolution HSPA and LTE for Mobile Broadband", Second Edition, Academic Press, 2008.
2. Anurag Kumar, D.Manjunath, Joy kuri, "Wireless Networking", First Edition, Elsevier 2011.
3. Simon Haykin , Michael Moher, David Koilpillai, "Modern Wireless Communications", First Edition, Pearson Education 2013

Course Code	**: CSL DE401**
Course Title	**: Nature Inspired Algorithms**
L-T-P/S=Credits	**: 3-0-2**

Syllabus

Unit I: Introduction to Algorithms
Topic I: What is an algorithm, Newton's method, Gradient Descent Method, Formulation for optimization problems, Optimization algorithms, search for optimality, No-free lunch theorem, Heuristic and Meta-heuristic algorithms, NP Hard and NP Complete Problems

Topic II: Mathematical foundations: Norms, Eigen values, Eigen vectors, Sequences & Series, Convex Optimization – Hessian Matrix, Subgradient Descent, Computational Complexity, Convex Hull- Graham Scan Algorithm, Random Variables & Probability distributions

Unit II: Simulated Annealing
SA: Annealing & Boltzman distributions, SA Parameters, SA Algorithms, Convergence properties, Stochastic tunnelling
Diiferential Evolution: Introduction, Diiferential Evolution, Variants, Choice of parameters, Convergence Analysis, Genetic Algorithm

Unit III: Particle Swarm Optimization
PSO Algorithm, Accelerated PSO, Implementation, Convergence Analysis, Binary PSO Ant Colony Optimization: Algorithm, Implementation and convergence analysis Genetic Algorithm: Algorithm, Implementation and convergence analysis

Unit IV: Nature Algorithms – I
Firefly Algorithm: Analysis, Implementation, Variants of Firefly algorithm, Applications, Why the Firefly is efficient Cuckoo Search: Cuckoo Breeding behavior, levy flights, cuckoo search, implementation, variants of cuckoo search Bat Algorithm: Analysis, Implementation, Binary BAT algorithm, Applications, Why the Bat is efficient

Unit V: Nature Algorithms – II
Grey-Wolf Algorithm: Analysis, Implementation, Variants of Grey-Wolf algorithm, Applications, Why the Grey-Wolf is efficient Whale algorithm: Analysis, Implementation, Variants of Whale algorithm, Applications, Why the Whale is efficient

List of Programs:

1. Implement a basic Genetic Algorithm for solving the Knapsack problem.
2. Apply Genetic Algorithm to optimize traveling salesman problem (TSP).
3. Optimize a function (e.g., sphere function or Rastrigin function) using Particle Swarm Optimization.
4. Apply Particle Swarm Optimization to train a neural network for classification tasks.
5. Solve the Traveling Salesman Problem (TSP) using Ant Colony Optimization.
6. Apply Ant Colony Optimization to network routing problems.
7. Implement Simulated Annealing for solving the Travelling Salesman Problem.
8. Apply Simulated Annealing for function optimization and parameter tuning in machine learning models.
9. Optimize a function (e.g., sphere function or Rastrigin function) using Simulated Annealing.
10. Implement Differential Evolution for multi-modal optimization problems.
11. Use Differential Evolution to optimize engineering design problems.
12. Implement the Cuckoo Search Algorithm to solve multi-objective optimization problems.
13. Apply the Cuckoo Search Algorithm to the feature selection problem in machine learning.
14. Solve multi-dimensional optimization problems using Firefly Algorithm.
15. Implement Bat Algorithm to solve non-convex optimization problems.

Course Outcomes
CO1: Define the basic concepts of Nature Inspired algorithms and analyse the performance of algorithms.
CO2: Explain the characteristics of combinatorial problems and relevant bio-inspired algorithms to be applied on it.
CO3: Analyse the working methodology of bio-inspired algorithms.
CO4: Ability to apply nature inspired algorithms to solve engineering optimization problems.

Textbooks:

1. Nature-Inspired Optimization Algorithms, Author: Xin-She Yang, Elsevier
2. Nature Inspired Algorithms and Their Applications, Wiley

Course Code : **CSL VA102**
Course Title : **Introduction to Artificial Intelligence**
L-T-P/S=Credits : **2-0-0**

Syllabus

1. Introduction to Artificial Intelligence:

- Definition and history of AI
- Importance of AI in the modern world
- Different branches of AI: Machine Learning, Expert Systems, Robotics, Natural Language Processing, etc.
- Real-world applications of AI (healthcare, finance, entertainment, etc.)

2. Fundamentals of Problem Solving in AI:

- Problem-solving techniques and strategies
- Search algorithms:
  - Uninformed search: Breadth-first, Depth-first, Uniform Cost
  - Informed search: A* search, Greedy search
- State-space representations and search trees

3. Basic Concepts in Machine Learning:

- Introduction to Machine Learning
- Types of learning:
  - Supervised Learning (classification and regression)
  - Unsupervised Learning (clustering, dimensionality reduction)
  - Reinforcement Learning (basic concepts)
- Simple machine learning models: Linear regression, k-nearest neighbors (KNN)

4. Introduction to Natural Language Processing (NLP):

- Basic concepts of NLP
- Text processing techniques: Tokenization, Stemming, Lemmatization
- Basic applications of NLP: Sentiment analysis, Text classification, Chatbots

5. Introduction to Neural Networks:

- Overview of Neural Networks
- Perceptrons: Basic unit of neural networks
- Introduction to Multi-layer Perceptrons (MLP)
- Simple neural network applications

6. Basic Tools for AI:

- Introduction to Python programming for AI
- Libraries used in AI: NumPy, Pandas, scikit-learn
- Simple data analysis and visualization with Python

7. Ethical Considerations in AI:

- Ethical challenges in AI (e.g., bias in algorithms)
- Privacy and security concerns
- The role of human oversight in AI systems
- The future of AI in society

Course Outcomes:

By the end of this course, students will be able to:

1. Understand Key AI Concepts:
2. Apply Basic AI Problem-Solving Techniques:
3. Understand and Use Basic Machine Learning Techniques:
4. Understand and Apply Basic NLP Techniques:
5. Understand Neural Networks and Their Applications:
6. Work with Python for AI:
7. Recognize Ethical Issues in AI Development:
8. Communicate AI Concepts

Course Code : **CSL SE102**
Course Title : **Introduction to Cloud Computing**
L-T-P/S=Credits : **2-0-0**

SYLLABUS

1. Fundamentals of Cloud Computing
- Definition and characteristics of cloud computing.
- Evolution and history of cloud computing.
- Key enabling technologies (virtualization, distributed computing).
- Benefits and challenges of cloud adoption.

2. Cloud Computing Models
- Service models: Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS).
- Deployment models: Public, Private, Hybrid, and Community clouds.

3. Cloud Architecture and Concepts
- Cloud computing architecture.
- Multitenancy, elasticity, scalability, and on-demand provisioning.
- The role of APIs in cloud computing.
- Cloud storage and computing concepts.

4. Virtualization Technology
- Basics of virtualization.
- Hypervisors and virtual machines.
- Role of virtualization in cloud computing.
- Containers vs. traditional virtualization.

5. Cloud Security
- Shared responsibility model.
- Security challenges in cloud computing.
- Authentication and authorization.
- Data encryption and secure access.

6. Cloud Service Providers Overview
- Overview of leading cloud providers (AWS, Microsoft Azure, Google Cloud Platform).
- Comparison of services and pricing.
- Selecting the right cloud provider for specific use cases.

7. Cloud Economics and Pricing
- Cloud pricing models: Pay-as-you-go, subscription, reserved instances.
- Cost management strategies.
- Total cost of ownership (TCO) and return on investment (ROI).

8. Real-World Applications of Cloud Computing
- Use cases in healthcare, education, finance, and e-commerce.
- Examples of cloud-based services and applications.
- Emerging trends: IoT, AI, and edge computing in the cloud.

9. Hands-On Exercises

- Setting up and managing a free cloud account (AWS, Azure, or Google Cloud).
- Launching virtual machines and managing resources.
- Basic cloud storage operations (uploading, sharing, and managing files).

Recommended Books

1. "Cloud Computing: Concepts, Technology & Architecture" by Thomas Erl.
2. "Mastering Cloud Computing" by Rajkumar Buyya, Christian Vecchiola, and S. Thamarai Selvi.
3. "Cloud Computing: A Hands-On Approach" by Arshdeep Bahga and Vijay Madisetti.
4. "Cloud Security and Privacy" by Tim Mather, Subra Kumaraswamy, and Shahed Latif.
5. "Architecting the Cloud" by Michael J. Kavis.

Course outcomes

1. Explain the fundamental concepts of cloud computing and its benefits.
2. Identify and compare cloud service models and deployment models.
3. Understand the role of virtualization in enabling cloud services.
4. Analyze the security challenges associated with cloud computing and best practices.
5. Compare leading cloud service providers and evaluate their offerings.
6. Apply basic cloud computing concepts to set up and manage cloud resources.
7. Describe the economic benefits and pricing models of cloud computing.

Course Code	**: CSL GE305**
Course Title	**: Probability and Statistics**
L-T-P/S=Credits	**: 3-1-0**

Syllabus

Probability and random variable : σ field; measurable space; construction of measure probability and properties; definitions, scope and examples of probability; sample spaces and events; axiomatic definition of probability; joint and conditional probabilities; independence, total probability; Bayes' rule and applications.

Definition of random variables, continuous and discrete random variables; cumulative distribution function (cdf) for discrete and continuous random variables; probability mass function (pmf); probability density functions (pdf) and properties; expectation: mean, variance and moments of a random variables.

Distribution Functions : Some special distributions: uniform, exponential, Chi-square, Gaussian, binomial, and poisson distributions; Law of large numbers; Central limit theorem and its significance.

Statistics: Scatter diagram; graphical residual analysis, Q-Q plot to test for normality of residuals, autocorrelation and autocovariance functions; stationarity and non stationarity ; correlation and covariance

Sampling distributions; point and interval estimation, testing of hypothesis, Goodness of fit and contingency tables, linear regression, ANOVA.

Introduction to stochastic process; random walk and Brownian motion.

COURSE OUTCOMES:

CO1. Understand the basic probability concepts and random variables that have numerous applications in computer science.
CO2. To understand fundamentals and application of statistics to engineering problems.
CO4. To form hypothesis and able to test hypothesis with various statistical tests.
CO5. Identify the concept of statistical quality control in computer science engineering.

Text Books

1. Sheldon M. Ross, "Introduction to Probability and Statistics for Engineers and Scientists", Academic Press.
2. D. C. Montgomery and G.C. Runger, "Applied Statistics and Probability for Engineers", 5th edition, John Wiley & Sons.
2. Robert H. Shumway and David S. Stoffer, "Time Series Analysis and Its Applications with R Examples", Third edition, Springer Texts in Statistics.

Course Code : **CSL DC 104**
Course Title : **Data structures**
L-T-P/S=Credits : **3-0-0**

SYLLABUS

Unit-1: INTRODUCTION

Introduction to data structures: Concept and Need of Data Structure, Definition, Abstract Data Type, Types of Data Structures: Linear Data Structures, Non-Linear Data Structures, Operations on Data Structures: Traversing, Insertion, Deletion, updating, searching, sorting, Study and implementation of basic data structure: Arrays, multidimensional arrays and their organization, storage structure for arrays, introduction to sparse arrays

Unit-2: LINKED LIST

Linked list (singly, doubly and circular): Dynamic storage, Concept of linked list, Difference of link list & array, Single linked list, Representation, Operations, Traversing, Insertion(first node, last node, at a position, after a node value), Deletion(first node, last node, at a position, after a node value), Double linked list, Representation , Operations, traversing, Insertion (first node, last node, at a position, after a node value), Deletion (first node, last node, at a position, after a node value), Introduction to Circular link list & header link list: examples and applications

Unit-3: STACKS & QUEUES

Stacks & Queues: Operations on Stack, Array & Linked Representation, Programs on stack: Push, Pop operations and traversing, Applications of stack. Operations on Queue, Array & Linked Representation, Programs on Queue: Insert, Deletion and traversing, Circular queue: Programs on Circular Queue: Insert, Deletion and traversing, Introduction to other types of queues: Deque, Priority Queue, Application of queue.

Unit-4: SORTING AND SEARCHING

Searching algorithm: Linear search and Binary search, Sorting algorithms: Bubble sort, Selection sort, Insertion sort, Quick sort, Merge sort

Unit-5: TREES AND GRAPHS

Introduction to trees and graphs: Tree terminology, Introduction to Types of Trees: Binary tree, Complete Binary Tree, Binary search tree, AVL Tree, Tree Traversal algorithms, Memory representation of trees, Applications of Trees, Graph: Graph terminology, Memory representation of graphs, Graph Traversal algorithms: BFS (breadth first search), DFS (depth first search), Applications of Graph

Course outcomes
Students will be able to achieve & demonstrate the following COs on completion of course based learning
CO1 - Perform basic operations on Arrays.
CO2 - Apply and compare different Searching and Sorting methods on the basis of time efficiency.
CO3 - Implement basic operations on Linked List.
CO4 - Perform operations on Stack using Array and Linked List Implementations.
CO5 - Perform operations on Queue using Array and Linked List Implementations.
CO6 - Understand and Traverse Tree and Graphs to solve real life problems

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Course Code : **CSL DE323**
Course Title : **Computer Network Security**
L-T-P/S=Credits : **3-0-2**

Syllabus

UNIT 1

Introduction to cryptography and network security, Networks OSI Model of networking layers, Importance of Security in networks, types on internetwork, attacks, security services pervasive security mechanism.

UNIT 2

Foundation of Modern Cryptography, private key cryptography, DES, TDEA, Block Ciphers, linear cryptanalysis, differential cryptanalysis, AES public key Cryptography, DH algorithm, Algorithms for discrete algorithms birth day paradox, pollard's p algorithm for discrete algorithm, EI Gomel public key, RSA, Elliptic curve cryptography, stream chippers

UNIT 3

Hashing Authentication & Signature Schemes Hashing schemes SHA- Family, MAC, Digital Signature RSA EI Gamel, DSS DSA Authentication Protocols, applications Kereberos X.509 Directory Services, E-mail security, Email architecture SSL PGP, MIME, S/MIME Internet Protocol Security (IPSec) IPSec architecture, IPSec verses other layers security, Mobile IPsec VPN Web Security, SSl, TLS, SETetc

UNIT 4

System Security Intruders, Types of Attacks, Protecting against Intruders, Honeypots, Scanning and analysis tools, Viruses and Worms, Types of Viruses, Protection, Firewall architecture implementing firewalls, XML firewalls, Trusted systems, Trusted system security implementation, wireless security.

Suggested Books:

Sr.	Name of Book, Author, Publisher
1	Cryptography and Network Security: Behrouz A. Forauzan 2/e
2	Cryptography and Network Security: William Stallings 4/e
3	Cryptography and Network Security: AtulKahate 2/e

Course Outcome

Sr	Course Outcome	CO
1	Identify factors driving the need for network security	CO1
2	Identify and classify particular examples of attacks	CO2
3	Define the terms vulnerability, threat and attack	CO3
4	Identify physical points of vulnerability in simple networks	CO4
5	Compare and contrast symmetric and asymmetric encryption systems and their vulnerability to attack, and the characteristics of hybrid systems	CO5

List of Experiments

NOTE: Experiments will be implemented in C/C++/Python.

Sr	Contents
1	Installation of Virtual Machine and Linux OS.
2	Practicing various network troubleshooting commands.
3	Write programs to implement traditional Ciphers.
4	Write a program to implement DES algorithm.
5	Write a program to implement 3DES algorithm.
6	Write a program to implement RSA algorithm.
7	Write a program to implement AES algorithm.
8	Write a program to implement message digest.
9	Installation and Configuration of Wireshark tool.
10	Analyzing network traffic using Wireshark.
11	Analyze and investigate network information of packets.
12	Understanding preliminary digital forensic using Wireshark.

Course Code : **CSL DC202**
Course Title : **Soft Computing**
L-T-P/S=Credits : **3-0-0**

Prerequisite: Neural Networks or Equivalent

Syllabus

Introduction to Soft Computing

Concept of computing systems, Soft computing versus "Hard" computing, Characteristics of Soft computing, Some applications of Soft computing techniques

Fuzzy logic

Introduction to Fuzzy logic, Fuzzy sets and membership functions, Operations on Fuzzy sets, Fuzzy relations, rules, propositions, implications and inferences, Defuzzification techniques, Fuzzy logic controller design, Some applications of Fuzzy logic.

Genetic Algorithms

Concept of "Genetics" and "Evolution" and its application to probabilistic search techniques, Basic GA framework and different GA architectures, GA operators: Encoding, Crossover, Selection, Mutation, etc., Solving single-objective optimization problems using GAs.

Multi-objective Optimization Problem Solving

Concept of multi-objective optimization problems (MOOPs) and issues of solving them, Multi-Objective Evolutionary Algorithm (MOEA), Non-Pareto approaches to solve MOOPs, Pareto-based approaches to solve MOOPs, Some applications with MOEAs.

Course Outcomes

CO1: Understand soft computing techniques and their role in problem solving.
CO2: Conceptualize and parameterize various problems to be solved through basic soft computing techniques.
CO3: Analyze and integrate various soft computing techniques in order to solve problems effectively and efficiently.

Books Recommended:

1. Fuzzy Logic: A Pratical approach, F. Martin, , Mc neill, and Ellen Thro, AP Professional, 2000.
2. Fuzzy Logic with Engineering Applications (3rd Edn.), Timothy J. Ross, Willey, 2010.
3. Fuzzy Logic for Embedded Systems Applications, Ahmed M. Ibrahim, Elesvier Press, 2004.
4. An Introduction to Genetic Algorithms, Melanie Mitchell, MIT Press, 2000.
5. Genetic Algorithms In Search, Optimization And Machine Learning, David E. Goldberg, Pearson Education, 2002.
6. Practical Genetic Algorithms, Randy L. Haupt and sue Ellen Haupt, John Willey & Sons, 2002.
7. Soft Computing, D. K. Pratihar, Narosa, 2008.
8. Neuro-Fuzzy and soft Computing, J.-S. R. Jang, C.-T. Sun, and E. Mizutani, PHI Learning, 2009.

Course Code : **CSL DE320**
Course Title : **High Performance Computing**
L-T-P/S=Credits : **3-1-0**

Prerequisites: Computer Organization and Architecture or equivalent

Syllabus: Parallel Processing Concepts; Levels and model of parallelism: instruction, transaction, task, thread, memory, function, data flow models, demand-driven computation; Parallel architectures: superscalar architectures, multi-core, multi-threaded, server and cloud;

Fundamental design issues in HPC: Load balancing, scheduling, synchronization and resource management; Operating systems for scalable HPC; Parallel languages and programming environments; OpenMP, Pthread, MPI, java, Cilk; Performance analysis of parallel algorithms;

Fundamental limitations in HPC: bandwidth, latency and latency hiding techniques; Benchmarking HPC: scientific, engineering, commercial applications and workloads; Scalable storage systems: RAID, SSD cache, SAS, SAN; HPC based on cluster, cloud, and grid computing: economic model, infrastructure, platform, computation as

service; Accelerated HPC: architecture, programming and typical accelerated system with GPU, FPGA, Xeon Phi, Cell BE; Power-aware

HPC Design: computing and communication, processing, memory design, interconnect design, power management; Advanced topics: peta scale computing; big data processing, optics in HPC, quantum computers.

HPC programming assignments: Hands on experiment and programming on parallel machine and HPC cluster using Pthread, OpenMP, MPI, Nvidia Cuda and Cilk. Also there will be some hands on experiments on standard multiprocessor simulator or cloud simulator.

Course Outcomes

CO1: Demonstrate understanding of the HPC laws, models and architectures.
CO2: Explain how algorithms can be parallelized.
CO3: Apply concepts and techniques of programming shared-memory multi-core and cluster computers.
CO4: Build and evaluate framework-based systems that utilize hybrid shared/distributed memory computer clusters.

Texts:

1.Georg Hager and Gerhard Wellein. Introduction to High Performance Computing for Scientists and Engineers (1st ed.). CRC Press, Chapman & Hall/CRC Computational Science, India, 2010.
2. Vipin Kumar , Ananth Grama , Anshul Gupta , George Karypis. Introduction to Parallel Computing (2nd ed.). Pearson India . 2003.
3. John L. Hennessy and David A. Patterson. Computer Architecture: A Quantitative Approach (5th ed.). Elsevier India Pvt. Ltd. 2011.
4. David B. Kirk and Wen-mei W. Hwu. Programming Massively Parallel Processors: A Hands-On Approach (1st ed.). Elsevier India Pvt. Ltd. 2010.
5. Michael T. Heath. Scientific Computing: An Introductory Survey (2nd ed.). McGraw Hill Education (India) Private Limited, 2011

Course Code : **CSE 4001**
Course Title : **Fundamentals of Cloud Computing**
L-T-P/S=Credits : **Non-Credit**

Syllabus

1. Introduction to Cloud Computing

- Overview of cloud computing concepts.
- Key features: On-demand provisioning, elasticity, scalability, and pay-as-you-go.
- Benefits and challenges of cloud adoption.
- Cloud service models: IaaS, PaaS, SaaS.
- Deployment models: Public, Private, Hybrid, and Community clouds.

2. AWS Overview

- Introduction to Amazon Web Services (AWS).
- Global AWS infrastructure: Regions, Availability Zones, and Edge Locations.
- Overview of key AWS services and their categories (Compute, Storage, Networking, and Databases).

3. AWS Core Services

- **Compute**:
  - Amazon EC2 basics: Launching, configuring, and managing virtual servers.
  - Introduction to AWS Lambda (serverless computing).
- **Storage**:
  - Amazon S3: Object storage and its use cases.
  - Amazon EBS: Block storage for virtual machines.
  - Amazon Glacier: Long-term archival storage.
- **Databases**:
  - Amazon RDS: Managed relational databases.
  - Amazon DynamoDB: NoSQL database for scalable applications.

4. Networking and Content Delivery

- Basics of networking in the cloud.
- Introduction to Amazon VPC (Virtual Private Cloud).
- Elastic Load Balancer (ELB) and Auto Scaling.
- Overview of Amazon CloudFront for content delivery.

5. Security and Identity

- Shared responsibility model in AWS.
- Basics of AWS Identity and Access Management (IAM).
- Role-based access control and policies.
- AWS Trusted Advisor for security best practices

Recommended Books

1. "AWS Certified Cloud Practitioner Study Guide" by Ben Piper.
2. "Cloud Computing: Concepts, Technology & Architecture" by Thomas Erl.
3. "Getting Started with AWS: Hosting Applications and Services on the Cloud" by Jeffrey Barr.
4. "AWS in Action" by Andreas Wittig and Michael Wittig.
5. AWS Whitepapers:
    - "Overview of Amazon Web Services"
    - "Architecting for the Cloud: AWS Best Practices"

Course Outcomes

By the end of this course, students will be able to:

1. Understand the foundational concepts of cloud computing and AWS architecture.
2. Identify the core AWS services and their practical use cases.
3. Launch and manage virtual servers using Amazon EC2.
4. Utilize Amazon S3 for secure and scalable object storage.
5. Understand and implement basic cloud networking with Amazon VPC and related services.
6. Gain knowledge of AWS security practices, including IAM and data encryption.
7. Monitor cloud resources and manage costs effectively using AWS tools.
8. Develop and deploy basic applications using AWS services.
9. Analyze real-world use cases to understand cloud solutions in various industries.

Course Code : **CSL SE104**
Course Title : **Introduction to Programming using Python**
L-T-P/S=Credits : **2-0-0**

Course Contents:

Unit-1 Introduction

Introduction to importance of IDEs like Spyder (Anaconda)/PyCharm for professional programming, explore Python shell as a calculator and for inputting Python expressions directly, HelloWorld program in Python script, Python keyword and Identifiers, Indentation, Comments, Data Types in. Operators in Python: comparison, arithmetic, logical, Boolean, bitwise, assignment. Python: numbers, list, tuple, strings, set, dictionary, conversion between various data types

Unit-2 Basic constructs

Input and Output in Python, if-else , for loop, while loop, break, pass, continue, creating Functions, functions with arguments, returning values form functions, lambda expressions, recursion, global and local variables, Importing other modules/packages and using their functions, creating random numbers/random-choice to create programs for simple guessing games like Rock –Paper-Scissors. Problems on 1D/2D/3D arrays using list. Problem solving using dictionary as look-up table.

Course Outcomes

CO1	Know the basic syntax and Data Structures in Python.
CO2	Think and Design solution in Object Oriented way as well as Procedural way.
CO3	Enjoy coding and compete at online programming sites like CodeChef, HackerEarth etc.

Course Code : **CSL SE105**
Course Title : **Artificial Intelligence in Applications**
L-T-P/S=Credits : **2-0-0**

Syllabus

1: Introduction to Artificial Intelligence
- Overview of AI and its importance in various industries.
- AI techniques and approaches: search algorithms, knowledge representation, reasoning.
- Intelligent agents and problem-solving strategies.
- AI in real-world applications: challenges and opportunities.

2: AI in Data Science and Machine Learning
- Role of AI in Data Science and Machine Learning (ML).
- Supervised and unsupervised learning algorithms.
- Regression, classification, clustering, and anomaly detection.
- Model evaluation techniques: accuracy, precision, recall, F1-score, and ROC curves.

3: AI in Natural Language Processing (NLP)
- Introduction to NLP and its challenges.
- Text preprocessing techniques: tokenization, stemming, lemmatization.
- Text classification, sentiment analysis, and named entity recognition.
- Applications of NLP in chatbots, information retrieval, and machine translation.

4: AI in Computer Vision
- Computer Vision: Basic concepts, image processing techniques.
- Object detection, image classification, and face recognition.
- Deep Learning for computer vision: Convolutional Neural Networks (CNNs).
- Applications of AI in autonomous vehicles, medical imaging, and surveillance.

5: AI in Robotics and Automation
- Robotics and AI integration: intelligent agents in physical environments.
- Path planning and motion control algorithms.
- Autonomous robots: SLAM (Simultaneous Localization and Mapping).
- Applications in manufacturing, drones, and autonomous vehicles.

6: AI in Healthcare

- AI techniques used in medical diagnostics, personalized medicine, and drug discovery.
- Machine learning models for predicting disease outcomes and patient care.
- Natural language processing for analyzing medical texts (e.g., EHR).
- Ethical considerations in AI-driven healthcare applications.

7: AI in Business and Finance
- AI in business analytics: demand forecasting, customer segmentation, and recommendation systems.
- Algorithmic trading, fraud detection, and risk management.

- Use of AI for optimizing business operations, marketing, and customer service.
- Impact of AI on financial decision-making and automated systems.

8: AI in Society: Ethics, Challenges, and Future Directions

- Ethical issues: fairness, bias, accountability, and transparency in AI applications.
- Regulatory and societal challenges: privacy concerns, job displacement, and automation.
- Future trends in AI applications: Artificial General Intelligence (AGI), AI in creativity and art.

Human-AI collaboration and the future of AI in society.

Course Outcomes

By the end of this course, students will be able to:

1. Understand Core AI Concepts
2. Identify AI Applications in Real Life
3. Apply Simple AI Algorithms
4. Develop Simple Machine Learning Models
5. Understand Natural Language Processing Basics
6. Learn Responsible AI Practices

Recommended Books

1. **Artificial Intelligence: A Modern Approach** by Stuart Russell and Peter Norvig
2. **Computer Vision: Algorithms and Applications** by Richard Szeliski
3. **Reinforcement Learning: An Introduction** by Richard S. Sutton and Andrew G. Bart.
4. **Artificial Intelligence in Practice** by Bernard Marr

Course Code : **CSL AE102**
Course Title : **Introduction to Cyber Security**
L-T-P/S=Credits : **2-0-0**

Detailed Syllabus

Unit-1-Introduction to Cyber Security

Cyber security increasing threat landscape, Cyber security terminologies- Cyberspace, attack, attack vector, attack surface, threat, risk, vulnerability, exploit, exploitation, hacker.

Unit-2 Cyber crimes

Cyber crimes targeting Computer systems and Mobiles- data diddling attacks, spyware, logic bombs, DoS, DDoS, APTs, virus, Trojans, ransomware, data breach., Online scams and frauds- email scams, Phishing, Vishing, Smishing, Online job fraud, Debit/ credit card fraud, Online payment fraud.

Unit-3 Cyber Law

Cyber crime and legal landscape around the world, IT Act,2000 and its amendments. Limitations of IT Act,2000. Cyber crime and punishments, Cyber Laws and Legal and ethical aspects related to new technologies-AI/ML, IoT, Blockchain, Darknet and Social media.

Unit-4 Data Privacy and Data Security

Defining data, meta-data, big data, nonpersonal data. Data protection, Data privacy and data security,Personal Data Protection Bill and its compliance, Data protection principles, Big data security issues and challenges.

Suggested Books:

Sr.	Name of Book, Author, Publisher	Year of Publication/Reprint
Text Books		
1	Marjie T. Britz Computer Forensics and Cyber Crime: An Introduction, Pearson	2012
2	AlfaredBasta and Wolf Holten, Computer Security Concepts, Issues and Implementation, CENGAGE learning	2015

3	Raghu Santanam, M. Sethumadhavan, MohitVirendraCyber Security, Cyber Crime and Cyber Forensics, IGIGlobal	2022
Reference Books		
1	George M. Mohay,AlisonAndersonComputer and intrusion forensics, Artech House	2006

Course Outcome

1	Understand the cyber security threat landscape.	CO1
2	Develop a deeper understanding and familiarity with various types ofcyberattacks, cyber crimes, vulnerabilities.	CO2
3	Analyse and evaluate existing legal framework and laws on cyber security.	CO3
4	Analyse and evaluate the importance of personal data its privacy and security.	CO4
5	Analyse and evaluate the security aspects of social media platforms andethical aspects associated with use of social media.	CO5

Course Code : **CSL GE403**
Course Title : **Introduction to Cyber Security**
L-T-P/S=Credits : **3-1-0**

Detailed Syllabus

Unit-1-Introduction to Cyber Security

Cyber security increasing threat landscape, Cyber security terminologies- Cyberspace, attack, attack vector, attack surface, threat, risk, vulnerability, exploit, exploitation, hacker., Non-state actors, Cyber terrorism, Protection of end user machine, Critical IT and National Critical Infrastructure, Cyberwarfare, Case Studies

Unit-2 Cyber crimes

Cyber crimes targeting Computer systems and Mobiles- data diddling attacks, spyware, logic bombs, DoS, DDoS, APTs, virus, Trojans, ransomware, data breach., Online scams and frauds- email scams, Phishing, Vishing, Smishing, Online job fraud, Online sextortion, Debit/ credit card fraud, Online payment fraud, Cyberbullying, website defacement, Cybersquatting, Pharming, Cyber espionage, Cryptojacking, Darknet-illegal trades, drug trafficking, human trafficking., Social Media Scams & Frauds- impersonation, identity theft,job scams, misinformation, fake newscyber crime against persons - cyber grooming, child pornography, cyberstalking., Social Engineering attacks, Cyber Police stations, Crime reporting procedure, Case studies.

Unit-3 Cyber Law

Cyber crime and legal landscape around the world, IT Act,2000 and its amendments. Limitations of IT Act,2000. Cyber crime and punishments, Cyber Laws and Legal and ethical aspects related to new technologies-AI/ML, IoT, Blockchain, Darknet and Social media, Cyber Laws of other countries, Case Studies

Unit-4 Data Privacy and Data Security

Defining data, meta-data, big data, nonpersonal data. Data protection, Data privacy and data security,Personal Data Protection Bill and its compliance, Data protection principles, Big data security issues andchallenges, Data protection regulations of other countries- General Data Protection Regulations(GDPR),2016
Personal Information Protection and Electronic Documents Act (PIPEDA)., Social media- data privacy andsecurity issues

Unit -5 Cyber security M a n a g e m e n t , Compliance and Governance

Cyber security Plan- cyber security policy, cyber crises management plan., Business continuity, Riskassessment, Types of security controls and their goals, Cyber security audit and compliance, National cybersecurity policy and strategy

Suggested Books:

Sr.	Name of Book, Author, Publisher	Year of Publication/Reprint
Text Books		
1	Marjie T. Britz Computer Forensics and Cyber Crime: An Introduction, Pearson	2012
2	AlfaredBasta and Wolf Holten, Computer Security Concepts, Issues and Implementation, CENGAGE learning	2015
3	Raghu Santanam, M. Sethumadhavan, MohitVirendraCyber Security, Cyber Crime and Cyber Forensics, IGIGlobal	2022
Reference Books		
1	George M. Mohay,AlisonAndersonComputer and intrusion forensics, Artech House	2006

Course Outcome

(17)

Sr	Course Outcome	CO
1	Understand the cyber security threat landscape.	CO1
2	Develop a deeper understanding and familiarity with various types ofcyberattacks, cyber crimes, vulnerabilities and remedies thereto.	CO2
3	Evaluate and communicate the human role in security systems with anemphasis o n ethics, social engineering vulnerabilities and training.	CO9
4	Increase awareness about cyber-attack vectors and safety against cyber-frauds.	CO10
5	Take measures for self-cyber-protection as well as societal cyber-protection	CO11

Course Code : **CSL DC305**
Course Title : **Machine Learning**
L-T-P/S=Credits : **3-0-0**

Syllabus

Unit 1: Introduction to Machine learning: Motivation and role of machine learning in computer science and problem solving. Representation (features), linear transformations, Appreciate linear transformations and matrix vector operations in the context of data and representation. Problem formulations (classification and regression). Appreciate the probability distributions in the context of data, Prior probabilities and Bayes Rule. Introduce paradigms of Learning (primarily supervised and unsupervised. Also a brief overview of others).

Unit 2: Fundamentals of Machine Learning: Statistical Decision Theory, Bias-variance Trade-off. Notion of Training, Validation and Testing; Connect to generalisation and overfitting. Subset Selection, Shrinkage Methods, PCA, Linear Discriminant Analysis and Dimensionality Reduction.

Unit 3: Selected Algorithms: Nearest Neighbours and KNN. Linear Regression, Multivariate Regression. Decision Tree Classifiers. Notion of Generalization and concern of Overfitting. Linear SVM, K Means, Logistic Regression, Naive Bayes and Ensembling and RF

Unit 4: Role of Loss Functions and Optimization, (ii) Gradient Descent and Perceptron/Delta Learning, (iii) MLP, (iv) Backpropagation (v) MLP for Classification and Regression, (vi) Regularisation, Early Stopping (vii) Parameter Estimation- Maximum Likelihood estimation and Bayesian Estimation.

Unit 5: Clustering Methods: Kernels (with SVM), Bayesian Methods, Generative Methods, HMM, GMM, EM, PAC learning.

Course Outcomes:

CO1 Know the basics and mathematics behind various Machine Learning algorithms.

CO2 Capability to implement basic algorithms using basic machine learning libraries mostly in python.

CO3 Enable formulating real world problems as machine learning tasks .

Co4 Think analytically and suggest possible solutions to problems using Machine Learning.

CO5 Ensure awareness about importance of core CS principles such as algorithmic thinking and systems design in ML

Suggested Books:

1. Marc Peter Deisenroth, A. Aldo Faisal, Cheng Soon Ong, Mathematics for Machine Learning, Cambridge University Press (23 April 2020) .
2. Tom M. Mitchell- Machine Learning- McGraw Hill Education, International Edition.
3. Aurélien Géron Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, O'Reilly Media, Inc. 2nd Edition
4. Ian Goodfellow, Yoshoua Bengio, and Aaron Courville Deep Learning MIT Press Ltd, Illustrated edition.
5. Christopher M. Bishop Pattern Recognition and Machine Learning- Springer, 2nd edition.

Course Code : **CSL DC302**
Course Title : **Deep Learning**
L-T-P/S=Credits : **3-0-0**

Syllabus

Unit 1:

History of Deep Learning, McCulloch Pitts Neuron, Thresholding Logic, Perceptrons, Perceptron Learning Algorithm, Multilayer Perceptrons (MLPs), Representation Power of MLPs, Sigmoid Neurons

Unit 2: Feedforward Neural Networks, Representation Power of Feedforward Neural Networks, FeedForward Neural Networks, Backpropagation Gradient Descent (GD), Momentum Based GD, Nesterov Accelerated GD, Stochastic GD, AdaGrad, RMSProp, Adam, Eigenvalue Decomposition

Unit 3: Autoencoders, Regularization in autoencoders, Variational autoencoders, Denoising autoencoders, Sparse autoencoders, Contractive autoencoders, Regularization: Bias Variance Tradeoff, Early stopping, Dataset augmentation, Parameter sharing and tying, Injecting noise at input, Ensemble methods.

Unit 4: Convolutional Neural Networks, LeNet, AlexNet, ZF-Net, VGGNet, GoogLeNet, ResNet, Visualizing Convolutional Neural Networks.

Unit 5: Recurrent neural networks (RNNs): Sequence modeling using RNNs, Back propagation through time, Long Short Term Memory (LSTM), Bidirectional LSTMs, Bidirectional RNNs, Gated RNN Architecture.

Unit 6: Generative models: Restrictive Boltzmann Machines (RBMs), Stacking RBMs, Belief nets, Learning sigmoid belief nets, Deep belief nets

Course Outcomes

CO1: Explain different network architectures and how these are used in current applications
CO2: Implement, train, and evaluate neural networks using existing software libraries
CO3: Present and critically assess current research on neural networks and their applications
CO4: Relate the concepts and techniques introduced in the course to your own research
CO5: Plan and carry out a research project on neural networks within given time limits

Recommended Books:

1. Deep Learning, An MIT Press book, Ian Goodfellow and Yoshua Bengio and Aaron Courville.
2. Satish Kumar, Neural Networks - A Class Room Approach, Second Edition, Tata McGraw-Hill, 2013
3. B. Yegnanarayana, Artificial Neural Networks, Prentice- Hall of India, 1999 4. C.M.
4. Bishop, Pattern Recognition and Machine Learning, Springer, 2006

Course Code **: CSL DE321**
Course Title **: Business Analytics Using R**
L-T-P/S=Credits **: 3-0-2**

Syllabus

Unit 1: Introduction to Data Analysis: 08 Overview of Data Analytics, Need of Data Analytics, Nature of Data, Classification of Data: Structured, Semi-Structured, Unstructured, Characteristics of Data, Applications of Data Analytics.

Unit 2: Introduction to R Programming: Overview of R programming, Features of R, Applications of R, Introduction and Installation of R Studio, Creation and Execution of R File in R Studio, Clear the Console and the Environment in R Studio , Basic Syntax in R Programming , R Commands, Variables and scope of variables, Data Types, Operators, Keywords.

Unit 3: R Programming Basics: How to take Input from user in R, Output in R using different functions, Decision making statements, Looping statements, Break next, return statements, Switch case, Data Structure in R: Vectors , Lists , Data frames , Matrices, Arrays.

Unit 4: Data Visualization using R : Reading and getting data into R (External Data): Using CSV files, XML files, Web Data, JSON files, Databases, Excel files. Working with R Charts and Graphs: Bar Charts, Line Graphs, Scatterplots, Pie Charts, Boxplots, Histograms

Unit 5: Statistics with R: Mean, Median and Mode, Variance and Standard Deviation, Descriptive Analysis, Normal Distribution, Binomial Distribution, Analysis of Variance (ANOVA) Test : One Way & Two Way ANOVA, Regression: Linear and Multiple Linear Regression, Logistic Regression. Time Series Analysis, Survival Analysis.

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Course Outcomes

CO1: To learn about Data analytics and its application areas.
CO2. To understand the use of R-software and its fundamental concepts for data analytics.
CO3. To be able to understand R Programming Decision making, functions, control statements and data structures.
CO4. To be able to understand data visualization using R programming. 5. To learn statistical methods and models for data analytics.

Suggested Books:

1. "R for Everyone", Jared P Lander, Pearson Education 2017, Latest Edition.
2. "Beginning R: An Introduction to Statistical Programming"-Larry Pace, Latest Edition.
3. "Big Data Fundamentals" Thomas Erl, Wajid Khattak,and Paul Buhler:: Concepts, Dribers and techniques , Pearson, Latest Edition.

Course Code : CSL DC205
Course Title : Data Analytics
L-T-P/S=Credits : 3-0-0

Syllabus

Ordered Statistics, probability distributions of Sample Range, Minimum and Maximum order Statistics. Random Sampling, Sampling distributions: Chi-square, T, F distributions.
Point Estimation: Sufficiency, Factorization theorem, Consistency, Moment method of estimation, Unbiased Estimation, Minimum Variance Unbiased Estimator and their properties, Rao-Cramer lower bound, Rao-Blackwellization, Fisher Information, Maximum Likelihood Estimator and properties, Criteria for evaluating estimators: Mean squared error.
Interval Estimation: Coverage Probabilities, Confidence level, Sample size determination, Shortest Length interval, Pivotal quantities, interval estimators for various distributions.
Testing of Hypotheses: Null and Alternative Hypotheses, Simple hypothesis, Composite hypothesis, Test Statistic, Critical region, Error Probabilities, Power Function, Level of Significance, Neyman-Pearson Lemma, One and Two Sided Tests for Mean, Variance and Proportions, One and Two Sample T-Test, Pooled T-Test, Paired T-Test, Chi-Square Test, Contingency Table Test, Maximum Likelihood Test, Duality between Confidence Intervals.
Bayesian Estimation: Prior and Posterior Distributions, Quadratic Loss Function, Posterior Mean, Bayes Estimates for well Known Distributions (Normal, Gamma, Exponential, Binomial, Poisson, Beta etc.)

Regression & ANOVA Regression ANOVA(Analysis of Variance)

Course Outcomes:

CO1: Apply statistical estimation and hypothesis testing methods to real-world datasets.
CO2: Use appropriate statistical software tools to perform estimations and hypothesis testing.
CO3: Understand a wide range of data analytic techniques around different types of data analytics, namely, descriptive, inferential, predictive, and prescriptive analytics.

Suggested Books:

1. Kandethody M. Ramachandran, Chris P. Tsokos, Mathematical Statistics with applications, Academic Press, 2009.

2. William W. Hines, Douglas C. Montgomery, David M. Goldsman, Connie M. Borror, Probability and Statistics in Engineering, 4th Edition, John Wiley & Sons, 2003.
3. Robert V. Hogg, Joseph W. McKean, Allen T. Craig, Introduction to Mathematical Statistics, 7th Edition, Pearson, 2012.

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Shri Mata Vaishno Devi University

School of Computer Science and Engineering
Faculty of Engineering, SMVDU
Kakryal, Katra 182320

ANNEXURE - G

Dated: 20.2.25

AEC/VAC/SEC opted by CSE 2023 and 2024 batch

Academic Session Year	Academic Session Cycle	Course Code	Course Name	Batch	Course Category
2023	JULY	MEM SE103	Engineering Graphics with CAD	2023 1st Sem	SEC
2023	JULY	CSL AE101	Introduction to Computer Application	2023 1st Sem	AEC
2023	JULY	LNM AE103	Professional Communication	2023 1st Sem	AEC
2023	JULY	MEM AE101	Presentation Skills & Technical Writing	2023 1st Sem	AEC
2023	JULY	NSP VA101	Sports and Fitness	2023 1st Sem	VAC
2023	JULY	MEL VA103	Entrepreneurship and Startup	2023 1st Sem	VAC
2024	JANUARY	EEL AE102	Electric Wiring	2023 2nd Sem	AEC
2024	JANUARY	MEM AE101	Presentation Skills & Technical Writing	2023 2nd Sem	AEC
2024	JANUARY	EEP SE102	MATLAB / Simulink	2023 2nd Sem	SEC
2024	JANUARY	CEM SE102	Earthquake Resistance Construction Practices	2023 2nd Sem	SEC
2024	JANUARY	MEM SE101	Engineering Workshop	2023 2nd Sem	SEC
2024	JANUARY	MEL SE104	3D Printing Technology	2023 2nd Sem	SEC
2024	JANUARY	NSP VA102	NCC	2023 2nd Sem	VAC
2024	JANUARY	NSP VA101	Sports and Fitness	2023 2nd Sem	VAC
2024	JANUARY	ECL VA102	Introduction to Digital Technology	2023 2nd Sem	VAC

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Shri Mata Vaishno Devi University

School of Computer Science and Engineering
Faculty of Engineering, SMVDU
Kakryal, Katra 182320

2024	JANUARY	NSP VA103	NSS	2023 2nd Sem	VAC
2024	JANUARY	MEL VA102	Introduction to Sustainability	2023 2nd Sem	VAC
2024	JANUARY	ESL VA102	Lifestyle for Environment	2023 2nd Sem	VAC
2024	JANUARY	CSL VA102	Introduction to Artificial Intelligence	2023 2nd Sem	VAC
2024	JULY	BTL VA102	Environmental Science & Education	2023 3rd sem	VAC
2024	JULY	EEP SE101	MATLAB / Simulink	2023 3rd sem	SEC
2024	JULY	NSM SE101	Music and Dance	2023 3rd sem	SEC
2024	JULY	noc24-cs88	Artificial Intelligence: Search Methods For Problem solving	2023 3rd sem	SEC
2024	JULY	CSL SE105	AI in Applications	2023 3rd sem	SEC
2025	JANUARY	NSP VA101	Sports and Fitness -I	2023 4th sem	VAC
2025	JANUARY	NSP VA102	NCC	2023 4th sem	VAC
2025	JANUARY	NSP VA103	NSS -I	2023 4th sem	VAC
2025	JANUARY	NSP VA104	NSS -II	2023 4th sem	VAC
2025	JANUARY	NSP VA106	Community Engagement and Social Responsibility (UBA)	2023 4th sem	VAC
2025	JANUARY	NSP VA108	Sports and Fitness- II	2023 4th sem	VAC
2024	JULY	MEM-SE103-A24	Engineering Graphics with CAD	2024 1st Sem	SEC
2024	JULY	CSL-AE101-A24	Introduction to Computer Application	2024 1st Sem	AEC

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Shri Mata Vaishno Devi University

School of Computer Science and Engineering

Faculty of Engineering, SMVDU

Kakryal, Katra 182320

2024	JULY	LNL AE103	French I	2024 1st Sem	AEC
2024	JULY	NSP-VA103-A24	NSS	2024 1st Sem	VAC
2024	JULY	MEL VA105	MATLAB for Engineers	2024 1st Sem	VAC
2024	JULY	PCL-VA101-A24	Understanding India	2024 1st Sem	VAC
2024	JULY	NSP-VA101-A24	Sports & Fitness	2024 1st Sem	VAC
2025	JANUARY	LNL AE102	Soft Skills through Literature-I	2024 2nd Sem	AEC
2025	JANUARY	LNL AE104	Writing Analysis Course	2024 2nd Sem	AEC
2025	JANUARY	EEM AE102	Electrical Wiring	2024 2nd Sem	AEC
2025	JANUARY	LNP AE104	Language Lab	2024 2nd Sem	AEC
2025	JANUARY	ALL AE102	Arts & Graphics	2024 2nd Sem	AEC
2025	JANUARY	CEL AE102	Introduction to disaster management	2024 2nd Sem	AEC
2025	JANUARY	LNL AE103	French-I	2024 2nd Sem	AEC
2025	JANUARY	LNL AE106	French-II	2024 2nd Sem	AEC
2025	JANUARY	MTL AE102	Introduction to Matrix Theory	2024 2nd Sem	AEC
2025	JANUARY	CSL AE102	Introduction to Cyber Security	2024 2nd Sem	AEC
2025	JANUARY	MEM SE102	Engineering Workshop	2024 2nd Sem	SEC
2025	JANUARY	MEP VA103	MATLAB for Engineers	2024 2nd Sem	VAC
2025	JANUARY	CSL VA102	Introduction to Artificial Intelligence	2024 2nd Sem	VAC
2025	JANUARY	NSP VA101	Sports and Fitness-I	2024 2nd Sem	VAC
2025	JANUARY	NSP VA102	NCC	2024 2nd Sem	VAC
2025	JANUARY	NSP VA103	NSS-I	2024 2nd Sem	VAC
2025	JANUARY	NSP VA104	NSS-II	2024 2nd Sem	VAC

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Shri Mata Vaishno Devi University

School of Computer Science and Engineering

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2025	JANUARY	NSP VA106	Community Engagement and Social Responsibility (UBA)	2024 2nd Sem	VAC
2025	JANUARY	NSP VA108	Sports and Fitness-II	2024 2nd Sem	VAC

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Shri Mata Vaishno Devi University

School of Computer Science and Engineering

Faculty of Engineering, SMVDU

Kakryal, Katra 182320

Annexure - H

Generic Elective Courses for Minor Specializations

The list of Generic Elective Courses with two minor specializations namely-

1. B. Tech. (Computer Science & Engineering), **Minor-I, Specialization in Artificial Intelligence**
2. B. Tech. (Computer Science & Engineering), **Minor-II, Specialization in Information Security**

List of Generic Elective Courses									
S. No.	**Course Code**	**Course Title**	**Pre Requisites**	**L**	**T**	**P**	**C**	**Semester**	**Minor Basket**
GEC – I									
1	CSL GE301	Introduction to Artificial Intelligence	Nil	3	1	0	4	5th	AI(1)
2	CSL GE303	Computer Network & Communication	Nil	3	0	2	4	5th	IS(1)
GEC – II									
3	CSL GE305	Probability & Statistics	Nil	3	1	0	4	5th	AI(2)
4	CSL GE307	Information & Coding Practices	Nil	3	1	0	4	5th	IS(2)
GEC – III									
5	CSL GE302	Introduction to Machine Learning	Introduction to Artificial Intelligence	3	0	2	4	6th	AI(3)
6	CSL GE304	Wireless Networks	Computer Network & Communication	3	0	2	4	6th	IS(3)
GEC – IV									
7	CSL GE306	Data Analytics	Probability & Statistics	3	0	2	4	6th	AI(4)
8	CSL GE308	Internet of Things	Nil	3	0	2	4	6th	IS(4)
GEC – V									
9	CSL GE401	Soft Computing	Introduction to Machine Learning	3	0	2	4	7th	AI(5)
10	CSL GE403	Introduction to Cyber Security	Nil	3	1	0	4	7th	IS(5)
GEC – VI									
11	CSL GE405	Natural Language Processing	Introduction to Machine Learning	3	1	0	4	7th	AI(6)
12	CSL GE407	Block Chain Technology	Computer Network & Communication	3	1	0	4	7th	IS(6)
GEC – VII									
13	CSL GE402	Artificial Intelligence for Engineering Applications	Introduction to Artificial Intelligence	3	1	0	4	8th	AI(7)
14	CSL GE404	Privacy & Security in Online Social Media	Introduction to Cyber Security	3	1	0	4	8th	IS(7)
15	CSL GE406	Prompt Engineering	Introduction to Artificial Intelligence	3	1	0	4	8th	AI(7)
16	CSL GE408	Information Response & Management	Introduction to Cyber Security	3	1	0	4	8th	IS(7)
17	CSL GE410	Vision Transformers	Introduction to Artificial Intelligence	3	1	0	4	8th	AI(7)
18	CSL GE412	Cloud Computing	Computer Network & Communication	3	1	0	4	8th	IS(7)

***AI stands for Artificial Intelligence.**

***IS stands for Information Security.**

Proposed Course Structure of B. Tech Programs as per NEP 2020

Program Structure of B. Tech.
Four Year Full Time Degree (Batch 2023 Onwards)

1st Semester

S. No.	Category	Course Code	Course Title	L	T	S/P	C
1.	BSC-1		Basic Science Course-1	x	x	x	4
2.	BSC 2		Basic Science Course-2	x	x	x	4
3	ESC-1		Engineering Science Course-1	x	x	x	4
4.	ESC-2		Engineering Science Course-2	x	x	x	4
5	SEC-1		Skill enhancement course-1	x	x	x	2
6	AEC-1/VAC1		Ability Enhancement Course/ Value Added Course	x	0	x	2
			Total Credits				**20**

2nd Semester

S. No.	Category	Course Code	Course Title	L	T	S/P	C
1.	BSC 3		Basic Science Course-3	x	x	x	4
2.	BSC 4		Basic Science Course-4	x	x	x	4
3	DCC-1		Departmental Core course	x	x	x	4
4	DCC-2		Departmental Core course	x	x	x	4
5	SEC-2		Skill enhancement course-2	x	x	x	2
6	AEC-2		Ability Enhancement Course	x	x	x	2
7	VAC-2		Value Added Course	x	x	x	2
8	MAC-1		Universal Human Values-II	2	0	0	NC
			Total Credits				**22**
Total Credits Earned at the end of 1st Year							42

Exit option: Students who opt to exit after completion of the first year and have secured 42 credits (As per the program structure) shall be awarded the UG Certificate if, in addition, they earn additional 6 credits through 2 months of summer internship/ ITI level course/skill-based course during the summer vacation of the first year.

Proposed Course Structure of B. Tech Programs as per NEP 2020

3rd Semester

S. No.	Category	Course Code	Course Title	L	T	S/P	C
1.	BSC-5		Basic Science Course-5	x	x	x	3
2.	ESC-3		Engineering Science course-3	x	x	x	4
3.	DCC-3		Departmental Core course-3	x	x	x	4
4.	DCC-4		Departmental Core course-4	x	x	x	4
5.	DCC-5		Departmental Core course-5	x	x	x	4
6.	SEC-3		Skill enhancement course-3	x	x	x	2
7.	AEC/VAC-3		Ability Enhancement Course/ Value Added Course	x	x	x	2
8.	PR		Summer internship-I	0	0	2	1
			Total Credits				**24**

Environmental Science & Education/Environmental Engineering to be offered as Value Added course in Semester II/III and a Mandatory requirement for the award of B. Tech Degree

4th Semester

S. No.	Category	Course Code	Course Title	L	T	S/P	C
1.	DCC-6		Departmental Core course-6	X	X	X	4
2.	DCC-7		Departmental Core course-7	X	X	X	4
3.	DCC-8		Departmental Core course-8	X	X	X	4
4.	DCC-9		Departmental Core course-9	X	X	X	4
5.	DCC-10		Departmental Core course-10	X	X	X	4
6.	VAC-4		Value Added Course-4	X	X	X	2
			Total Credits				**22**

Exit: Students who opt to exit after completion of the second year and have secured 88 credits (As per the program structure) shall be awarded the UG Diploma if, in addition, they earn additional 6 credits through 2 months of summer internship/ Diploma level courses/skill-based courses during the summer vacation of the second year.

Proposed Course Structure of B. Tech Programs as per NEP 2020

5th Semester

S. No.	Category	Course Code	Course Title	L	T	S/P	C
1.	DCC-11		Departmental Core course-11	X	X	X	4
2.	DCC-12		Departmental Core course-12	X	X	X	4
3.	DCC-13		Departmental Core course-13	X	X	X	4
4.	DEC-1		School Elective – I	X	X	X	4
4.	DEC-2/GEC-1		School Elective – II/Generic elective -I	X	X	X	4
5.	PR		Summer Internship-II	X	X	X	1
6.	PR		Project Work-1	0	0	4	2
7.	MAC-2		Indian Knowledge System	2	0	0	NC
			Total Credits				**23**

6th Semester

S. No.	Category	Course Code	Course Title	L	T	S/P	C
1.	DCC-14		Departmental Core course-14 AI/ML Course mandatory for all B. Tech programs to be offered in Sem V/VI	x	x	x	4
2.	DCC-15		Departmental Core course-15	x	x	x	4
3.	DEC-3		School Elective - III	x	x	x	4
4.	DEC-4/GEC-2		School Elective – IV/Generic elective -II	x	x	x	4
5.	AEC (comp)		Management Course/ Entrepreneurship/Economy	x	x	x	3
6.	PR		Project Work –II	0	0	4	2
			Total Credits				**21**
7.	DEC/GEC (Additional)		**For earning Honor's/Minor Specialization**				

Exit option: Students who opt to exit after completion of the third year and have secured 132 credits (As per the program structure) shall be awarded B.VOC Degree in the Major discipline if, in addition, they have completed summer internship of additional 4 credits during the summer vacation of the third year.

Proposed Course Structure of B. Tech Programs as per NEP 2020

7th Semester

S. No.	Category	Course Code	Course Title	L	T	S/P	C
1.	**DCC-16**		Departmental Core course-16	x	x	x	4
2	**DEC-5**		School Elective – V	x	x	x	4
3	**DEC 6/GEC 3**		School Elective – VI/ Generic Elective – III	x	x	x	4
4	**PR**		Project Work –III	0	0	8	4
5	**PR**		Summer Internship – III	0	0	4	2
			Total Credits				**18**
	DEC/GEC (Additional)		**For earning Honor's/Minor Specialization**				

8 th Semester

S. No.	Category	Course Code	Course Title	L	T	S/P	C
1.	**PR**		Major Project / Internship				10
			Total Credits				10
			For earning Honor's/Minor Specialization				
			Total Credits (B.Tech)				**160**
	DEC/GEC (Additional)						

Award of Degree:

A) **B.Tech. degree:** Students who successfully earn the 160 credits (As per the program structure) and had not opted for Honors/Minor specialization will be awarded the B.Tech. degree in the discipline subject to their meeting all other requirements.

B) **B.Tech. degree with Honors (Discipline specific Specialization):** Students who had opted for Honors degree (Specialization within discipline) will be awarded the B.Tech. degree with Honors (subject to their meeting all other requirements), if they have successfully earned 172 Credits, out of which 24 credits must have been earned through the basket of the specified specializationand 12 credits from the general basket of DEC/GEC.

C) **B.Tech. degree with Minor Specialization (Specialization from other Disciplines):** Students who had opted for Minor Specialization (Specialization from other disciplines) will be awarded the B.Tech. degree with Minor Specialization, if they have successfully earned 172 Credits, out of which 24 credits must have been earned through the basket of the Minor specialization (GEC category courses).

Proposed Course Structure of B. Tech Programs as per NEP 2020

Credit Break Up

S.No.	Category	Credit break Up SMVDU
1	Humanities and Social Sciences, Management Courses (AEC/VAC)	13
2	Basic Science Courses	19
3	Engineering Science Courses	12
	Skill Enhancement Courses	06
4	Departmental Core Courses	64
5	Departmental Elective Courses/Generic elective courses	24
7	Project Work, Seminar/Internship	22
	Mandatory Course	NC
	Total Credits	**160**

(3)

SHRI MATA VAISHNO DEVI UNIVERSITY
Kakryal, Katra-182320, Jammu & Kashmir
Recognized under Section 2(f) & 12(B) of the UGC Act, 1956
registrar@smvdu.ac.in

विज्ञानं ब्रह्म

Ref. No.: SMVDU/AA /25/ 1040

Date: 5th Feb, 2025

INTER OFFICE CORRESPONDENCE

From	To
Dean AA	All Heads / I/c Heads

Sub: -37th Meeting of the Academic Council of SMVD University

In continuation to this office IOC no. SMVDU/AA/24/958 dated: 23rd Dec., 2024, all Heads / I/c Heads are hereby informed that the 37th meeting of Academic Council of SMVD University shall be held on 28th Feb, 2025 at SMVDU Campus.

Accordingly it is enjoined upon to submit the proposed Agenda items of your concerned School, which are required to be placed before the Academic Council for appropriate consideration. The Agenda items should be submitted by or before 17th Feb, 2025 positively after which no Agenda items / proposals shall be entertained.

05.02.2025

Dean (Academic Affairs)

Copy to:

(i) Registrar, for information
(ii) AR (VC Secretariat), for information of Hon'ble Vice Chancellor
(iii) Concerned File

(2)

श्री माता वैष्णो देवी विश्वविद्यालय
SHRI MATA VAISHNO DEVI UNIVERSITY
Kakryal, Katra-182320, Jammu &
Kashmir Recognized under Section 2(f) &
12(B) of the UGC Act, 1956

Ref. No.: SMVDU/AA/25/ 1086 **Date:** 20th Feb., 2025

Office Order

Sub: Rescheduling of the meeting of 37th Academic Council

Ref. No.: SMVDU/AA/25/ 1072, dated: 14th Feb. 205

It is for information of all the concerned that the 37th meeting of the Academic Council shall now be held on 7th March, 2025 instead of 28th Feb. 2025 as notified earlier. The timing and venue for the said meeting shall however remain the same.

Date and Time: 7th March, 2025 (Friday) at 11:00 a.m.

Venue: AB Committee Room, Administrative Block, SMVDU.

This issues with the approval of the Competent Authority.

Registrar

Copy to:

1. All Deans/ All Heads, for information and n.a.
2. Finance Officer, for information and n.a.
3. University Engineer, for information and n.a.
4. I/c Guest House, for information and n.a.
5. I/c Transport for information and n.a.
6. Faculty I/c Audio/Visual, for information and n.a.
7. I/c PRO, for information and n.a.
8. AR (VC Office) for information of the Hon'ble Vice Chancellor.
9. I/c (Security), for information.
10. Concerned file.

(1)

विज्ञानं ब्रह्म

श्री माता वैष्णो देवी विश्वविद्यालय

SHRI MATA VAISHNO DEVI UNIVERSITY

Kakryal, Katra-182320, Jammu & Kashmir
Recognized under Section 2(f) & 12(B) of the UGC Act, 1956

SMVDU/AA/25/1089
Dated: 21-02-2025

NOTIFICATION

With reference to proposal of Head, SoCSE duly recommended & forwarded by Dean, FoE and as approved by the Competent Authority, Sanction of the Competent Authority is hereby conveyed for the following:

1. Conduct of meeting of Board of Studies of School of Computer Science & Engineering on 20-2-2025.
2. Inviting the External member of BoS of School of Computer Science & Engineering for attending the meeting, Prof. Vijay Laxmi, Department of Computer Science and Engineering, Malaviya National Institute of Technology, Jaipur via online mode.
3. Payment of honorarium in favour of Prof. Vijay Laxmi ,External Expert, as per University rules.

20.02.2025
Dean(AA)

Copy to:

1. Dean , Faculty of Engineering, for information.
2. Finance Officer, for information.
3. Head, SoCSE, for information.
4. AR(VC office), for the information of the Hon'ble Vice Chancellor.
5. Concerned File.