DEPARTMENT OF COMPUTER SCIENCE

ST. XAVIER'S COLLEGE, RANCHI

(AN AUTONOMOUS COLLEGE UNDER RANCHI UNIVERSITY, RANCHI)

CBCS CURRICULUM OF

B. Sc. INFORMATION TECHNOLOGY

HONOURS PROGRAMME

FOR UNDERGRADUATE COURSE

IMPLEMENTED FROM

ACADEMIC SESSION 2025 – 28

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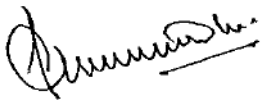
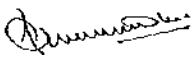
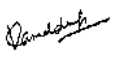
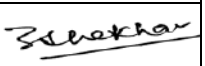
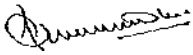
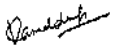
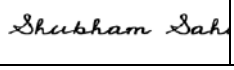
The meeting of the Board of Studies, Department of Computer Science held on Saturday 29th of November 2025 at 11:00 a.m. in the Conference Hall, St. Xavier's College, Ranchi. The meeting was attended by following members: -

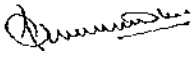
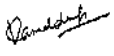
SL. No	Name	Signature
1.	Dr. Swarat Chaudhuri Head of the Department (Chairman)	
2.	Dr. Kamaldeep Assistant Professor (Faculty Member)	
3.	Surya Narayan Prasad Assistant Professor (Faculty Member)	
4.	Dr. Rakesh Raja Assistant Professor (Faculty Member)	
5.	Prof. Ritesh Kumar Assistant Professor (Faculty Member)	
6.	Prof. Gurpreet Singh Assistant Professor (Faculty Member)	

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

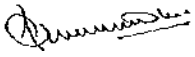
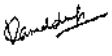
SL. No	Name	Signature
7.	Dr. Bhaskar Karn Associate Professor Department of Computer Science and Engineering Birla Institute of Technology Mesra, Ranchi, Jharkhand (Subject Expert)	
8.	Dr. Chandrashekhar Azad Associate Professor Department of Computer Science and Engineering National Institute of Technology Jamshedpur, Jharkhand (Subject Expert)	
9.	Prof. (Ms.) Swagata Ghosh Assistant Professor Department of MCA, Ranchi University, Ranchi (Nominee Vice Chancellor, Ranchi University, Ranchi)	
10.	Mr. Shiwanshu Dasgupta Manager – IT Assistant Divisional Manager LIC of India, Ranchi (Representative from Industry)	
11.	Mr. Shubham Sahay Developer, Co – Lead, Early Talent Ambassador India Network at SAP Labs, Bengaluru, India (Post Graduate Meritorious Alumnus)	

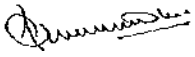
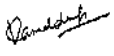
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Course Structure for Undergraduate B. Sc. (Honours) Programme in Information Technology		
SL. No.	**Contents**	**Page No.**
1.	**Course Structure for Honours Programme in Information Technology**	**11**
2.	**Semester Wise Course Structure for Honours Programme in Information Technology**	**12 – 17**
3.	**Course structure for B.Sc. (Vocational Honours Programme) in Information Technology**	**18 – 19**
4.	**Semester Wise Distribution of Papers**	**20**
5.	**Semester Wise Distribution of Credits**	**21**
6.	**Subject Combinations allowed for B.Sc. (Vocational Honours) Information Technology Programme (164 Credits)**	**22**
7.	**Semester Wise Structure for Mid Semester and End Semester Examination**	**23 – 26**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Course Structure for Undergraduate B. Sc. (Honours) Programme in Information Technology			
First Semester			
SL. No.	Sub SL. No.	Course Code: Course Name	Page No.
Paper Name			
8.	I.	Ability Enhancement Compulsory Course I: English Communication	28 – 33
	II.	Generic Elective [GE 1A]: Statistics[Statistical Methods]	34 – 38
	III.	Generic Elective [GE 1B]: Mathematics [Differential Calculus and Coordinate Geometry 2D]	39 – 43
	IV.	Core Course [CC1]: Programming using C/C++	44 – 55
	V.	Core Course [CC2]: Computer System Architecture	56 – 67
	VI.	Core Course Practical 1(CP1): C1 Lab and C2 Lab	68 – 70

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
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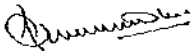
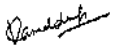
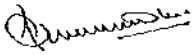
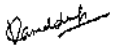
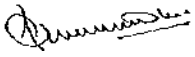
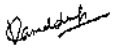
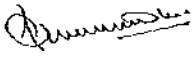
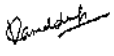
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

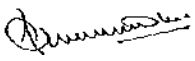
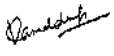
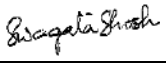
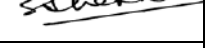
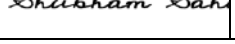
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Course Structure for Undergraduate B. Sc. (Honours) Programme in Information Technology			
Fifth Semester			
SL. No.	**Sub SL. No.**	**Course Code: Course Name**	**Page No.**
12.	I.	Discipline Specific Elective Course [DSE1]: Information Security	217 – 225
	II.	Discipline Specific Elective Course [DSE2]: Python Programming	226 – 235
	III.	Discipline Specific Practical 1(EP1): DSE1 Lab and DSE2 Lab	236 – 238
	IV.	Core Course [CC11]: Internet Technologies	239 – 249
	V.	Core Course [CC12]: Software Project Management	250 – 259
	VI.	Core Course Practical 5(CP5): CC11 Lab and CC12 Lab	260 – 262

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Annexure		
SL. No.	**Contents**	**Page No.**
	Semester Wise Distribution of Credits for Honours Programme	**305**
	Sample Calculation for SGPA for B.Sc. (Honours) Programme	**306 – 308**
	Sample Calculation for CGPA for B.Sc. (Honours) Programme	**309**

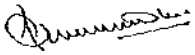
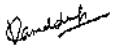
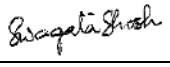
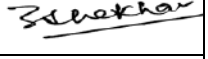
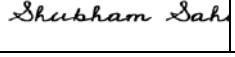
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Course Structure for Under Graduate B.Sc. (Honours) Programme in Information Technology

SL. No.	Course Type		Number	Credits	Total Credits
1.	Core Course		14	6	84
2.	Elective Course				
	a.	Discipline Specific	4	6	24
	b.	Generic/Interdisciplinary*	4	6	24
	c.	Generic/Interdisciplinary*	4	6	24
3.	Ability Enhancement Compulsory Course				
	a.	English Communication	1	2	2
	b.	Environmental Studies	1	2	2
	c.	Skill Enhancement Course of the Core Course Opted	2	2	4
Grand Total					164

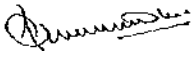
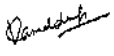
Note:

In the Academic Council Meeting of Ranchi University, Ranchi, held on 27.02.2019, it is resolved that Students will be offered Two Generic Elective Subjects (GE-A & GE-B) in C.B.C.S. U.G. Honours Courses of all streams, so that their "Eligibility for Admission" in P.G., Vocational & Technical Courses in various Institutions is not hampered.

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Course Structure for Under Graduate B.Sc. (Honours) Programme in Information Technology							
SL. No.	**Paper Type**	**With Practical**	**With Tutorial**	**Theory Credits**	**Practical Credits**	**Tutorial Credits**	**Total Credits**
First Semester							
1.	**Ability Enhancement Compulsory Course 1**	**No**	**No**	**2**	**0**	**0**	**2**
2.	**Generic Elective 1A**	**No**	**Yes**	**5**	**0**	**1**	**6**
3.	**Generic Elective 1B**	**No**	**Yes**	**5**	**0**	**1**	**6**
4.	**Core Course 1**	**Yes**	**No**	**4**	**2**	**0**	**6**
5.	**Core Course 2**	**Yes**	**No**	**4**	**2**	**0**	**6**
				20	**4**	**2**	**26**

Note:
In the Academic Council Meeting of Ranchi University, Ranchi, held on 27.02.2019, it is resolved that Students will be offered Two Generic Elective Subjects (GE-A & GE-B) in C.B.C.S. U.G. Honours Courses of all streams, so that their "Eligibility for Admission" in P.G., Vocational & Technical Courses in various Institutions is not hampered.

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
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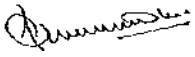
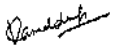
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

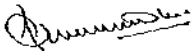
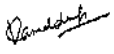
Course Structure for Under Graduate B. Sc. (Honours) Programme in Information Technology							
SL. No.	Paper Type	With Practical	With Tutorial	Theory Credits	Practical Credits	Tutorial Credits	Total Credits
Second Semester							
1.	Ability Enhancement Compulsory Course 2	No	No	2	0	0	2
2.	Generic Elective 2A	No	Yes	5	0	1	6
3.	Generic Elective 2B	No	Yes	5	0	1	6
4.	Core Course 3	Yes	No	4	2	0	6
5.	Core Course 4	No	Yes	5	1	0	6
				21	3	3	26

Note:
In the Academic Council Meeting of Ranchi University, Ranchi, held on 27.02.2019, it is resolved that Students will be offered Two Generic Elective Subjects (GE-A & GE-B) in C.B.C.S. U.G. Honours Courses of all streams, so that their "Eligibility for Admission" in P.G., Vocational & Technical Courses in various Institutions is not hampered.

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

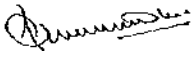
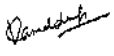
Course Structure for Under Graduate B. Sc. (Honours) Programme in Information Technology							
SL. No.	Paper Type	With Practical	With Tutorial	Theory Credits	Practical Credits	Tutorial Credits	Total Credits
Third Semester							
1.	Skill Enhancement Course 1	Yes	No	1	1	0	2
2.	Generic Elective 3A	No	Yes	5	0	1	6
3.	Generic Elective 3B	No	Yes	5	0	1	6
4.	Core Course 5	Yes	No	4	2	0	6
5.	Core Course 6	No	Yes	5	1	0	6
6.	Core Course 7	No	Yes	5	1	0	6
				25	5	2	32

Note:
In the Academic Council Meeting of Ranchi University, Ranchi, held on 27.02.2019, it is resolved that Students will be offered Two Generic Elective Subjects (GE-A & GE-B) in C.B.C.S. U.G. Honours Courses of all streams, so that their "Eligibility for Admission" in P.G., Vocational & Technical Courses in various Institutions is not hampered.

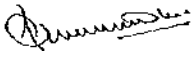
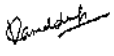
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Course Structure for Under Graduate B. Sc.(Honours) Programme in Information Technology							
SL. No.	Paper Type	With Practical	With Tutorial	Theory Credits	Practical Credits	Tutorial Credits	Total Credits
Fourth Semester							
1.	Skill Enhancement Course 2	Yes	No	1	1	0	2
2.	Generic Elective 4A	No	Yes	5	0	1	6
3.	Generic Elective 4B	No	Yes	5	0	1	6
4.	Core Course 8	Yes	No	4	2	0	6
5.	Core Course 9	No	Yes	5	1	0	6
6.	Core Course 10	No	Yes	5	1	0	6
				25	5	2	32

Note:
In the Academic Council Meeting of Ranchi University, Ranchi, held on 27.02.2019, it is resolved that Students will be offered Two Generic Elective Subjects (GE-A & GE-B) in C.B.C.S. U.G. Honours Courses of all streams, so that their "Eligibility for Admission" in P.G., Vocational & Technical Courses in various Institutions is not hampered.

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Course Structure for Under Graduate B. Sc. (Honours) Programme in Information Technology							
SL. No.	Paper Type	With Practical	With Tutorial	Theory Credits	Practical Credits	Tutorial Credits	Total Credits
Fifth Semester							
1.	Discipline Specific Elective Course 1	Yes	No	4	2	0	6
2.	Discipline Specific Elective Course 2	Yes	No	4	2	0	6
3.	Core Course 11	Yes	No	4	2	0	6
4.	Core Course 12	Yes	No	4	2	0	6
				16	8	0	24

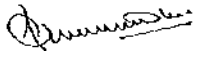
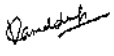
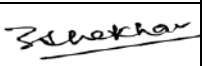
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Course Structure for Under Graduate B. Sc. (Honours) Programme in Information Technology							
SL. No.	Paper Type	With Practical	With Tutorial	Theory Credits	Practical Credits	Tutorial Credits	Total Credits
Sixth Semester							
1.	Discipline Specific Elective Course 3	Yes	No	4	2	0	6
2.	Discipline Specific Elective Course 4	No	Yes	0	0	6	6
3.	Core Course 13	Yes	No	4	2	0	6
4.	Core Course 14	Yes	No	4	2	0	6
				12	6	6	24

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

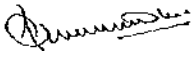
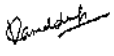
Course structure for B.Sc. (Vocational Honours Programme) in Information Technology

Table AI-1.1: Course structure for B.Sc. (Vocational Honours Programme) in Information Technology				
Semester	**Honours (Core Papers) (14 Papers)**	**Allied (Elective Papers) (12 Papers)**	**Ability Enhancement (Compulsory Course) (4 Papers)**	**Total Credits**
First	**CC1 and CC2 (6 Credits + 6 Credits = 12 Credits)**	**GE1A and GE1B (6 Credits + 6 Credits = 12 Credits)**	**English Communication (2 Credits)**	**26**
Second	**CC3 and CC4 (6 Credits + 6 Credits = 12 Credits)**	**GE2A and GE2B (6 Credits + 6 Credits = 12 Credits)**	**Environmental Studies (2 Credits)**	**26**
Third	**CC5, CC6 and CC7 (6 Credits + 6 Credits + 6 Credits = 18 Credits)**	**GE3A and GE3B (6 Credits + 6 Credits = 12 Credits)**	**Skill Enhancement Course1 (2 Credits)**	**32**
Fourth	**CC8, CC9 and CC10**	**GE4A and GE4B**	**Skill Enhancement Course2**	**32**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

	(6 Credits + 6 Credits + 6 Credits = 18 Credits)	(6 Credits + 6 Credits = 12 Credits)	(2 Credits)	
Fifth	CC11 and CC12 (6 Credits + 6 Credits = 12 Credits)	DSE1 and DSE2 (6 Credits + 6 Credits = 12 Credits)	N/A	24
Sixth	CC13 and CC14 (6 Credits + 6 Credits = 12 Credits)	DSE3 and DSE4 (6 Credits + 6 Credits = 12 Credits)	N/A	24
	14 Core Papers X 6 Credits = 84 Credits	12 Elective Papers X 6 Credits = 72 Credits	8 Enhancement Papers X 2 Credits = 8 Credits	164 Credits

Note:
In the Academic Council Meeting of Ranchi University, Ranchi, held on 27.02.2019, it is resolved that Students will be offered Two Generic Elective Subjects (GE-A & GE-B) in C.B.C.S. U.G. Honours Courses of all streams, so that their "Eligibility for Admission" in P.G., Vocational & Technical Courses in various Institutions is not hampered.

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Semester Wise Distribution of Papers

SL. No.	Semester	Ability Enhancement Compulsory Course	Core Course	Generic Elective	Skill Enhancement Course	Discipline Specific Elective Course
1.	First	1	2	2*	0	0
2.	Second	1	2	2*	0	0
3.	Third	0	3	2*	1	0
4.	Fourth	0	3	2*	1	0
5.	Fifth	0	2	0	0	2
6.	Sixth	0	2	0	0	2

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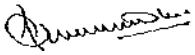
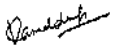
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Semester Wise Distribution of Credits

SL. No.	Semester	Ability Enhancement Compulsory Course	Core Course	Generic Elective	Skill Enhancement Course	Discipline Specific Elective Course	Total
1.	First	2	12	12	0	0	26
2.	Second	2	12	12	0	0	26
3.	Third	0	18	12	2	0	32
4.	Fourth	0	18	12	2	0	32
5.	Fifth	0	12	0	0	12	24
6.	Sixth	0	12	0	0	12	24
Grand Total		4	84	48	4	24	164

Note:

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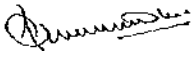
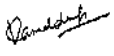
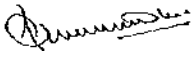
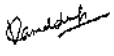
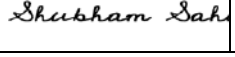
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

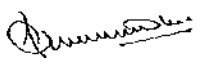
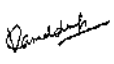
Subject Combinations allowed for B.Sc. (Vocational Honours) Information Technology Programme (164 Credits)

Table AI-2: Subject Combinations allowed for B.Sc. (Vocational Honours) Information Technology Programme (164 Credits)			
Honours/Core Subject CC 14 Papers	**Discipline Specific Elective Subject DSE 4 Papers**	**Skill Enhancement Course SEC 2 Papers**	**Ability Enhancement Compulsory Course AECC 2 Papers**
Information Technology	**Information Technology Specific**	**SEC in Information Technology**	**English Language Communication + Environmental Studies**

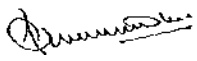
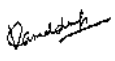
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Semester wise Examination Structure for Mid Semester & End Semester Examinations:

Semester wise Examination Structure for Mid Semester & End Semester Examinations						
Semester	Paper Code	Paper Name	Attendance	Mid Semester Examination (Theory) (Full Marks)	End Semester Examination (Theory) (Full Marks)	End Semester Examination (Practical and / Viva Voice) (Full Marks)
First	AECC	English Communication	0	0	100	0
	GE1A	Statistics	0	0	100	0
	GE1B	Mathematics	0	0	100	0
	CC1	Programming using C/C++ + Lab	0	15	60	50
	CC2	Computer System Architecture + Lab	0	15	60	
Second	AECC	Environmental Studies	0	0	100	0
	GE2A	Statistics	0	0	100	0
	GE2B	Mathematics	0	0	100	0

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

	CC3	Data Structure using C + Lab	0	15	60	50
	CC4	Discrete Structure	0	15	60	
Third	SEC1	Introduction to Android Programming	0	0	100	0
	GE3A	Statistics	0	0	100	0
	GE3B	Mathematics	0	0	100	0
	CC5	Object Oriented Programming using Java + Lab	0	15	60	75
	CC6	Operating System + Lab	0	15	60	
	CC7	Computer Networks + Lab	0	15	60	
Fourth	SEC2	HTML Programming and PHP Programming + Lab	0	0	100	0
	GE4A	Statistics	0	0	100	0
	GE4B	Mathematics	0	0	100	0
	CC8	Theory of Computation	0	25	75	00

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
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Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

	CC9	Visual Basic.Net + Lab	0	15	60	50
	CC10	Database Management System + Lab	0	15	60	
Fifth	DSE1	Information Security + Lab	0	15	60	50
	DSE2	Python Programming + Lab	0	15	60	
	CC11	Internet Technologies + Lab	0	15	60	50
	CC12	Software Project Management + Lab	0	15	60	
Sixth	DSE3	Cloud Computing + Lab	0	15	60	50
	DSE4	On Job Training and Project Work / Dissertation	0	15	60	
	CC13	Artificial Intelligence + Lab	0	15	60	50

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
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Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

	CC14	**Computer Graphics + Lab**	**0**	**15**	**60**	

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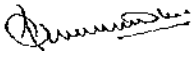
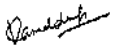
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
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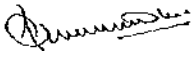
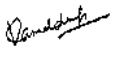
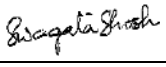
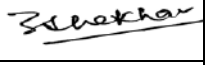
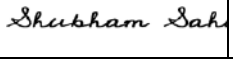
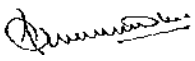
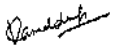
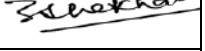
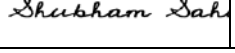
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

First Semester

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

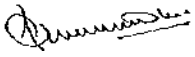
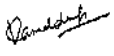
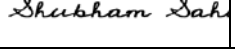
I. English Communication as Ability Enhancement Compulsory Course I (AECC I) i.e. AECC – I

English Communication as Ability Enhancement Compulsory Course(AECC)									
Paper Code	**Paper Name**	**Paper Type**	**Total Credits**	**Full Marks**	**Pass Marks**	**Attendance**	**MSE**	**ESE (Theory)**	**ESE (Practical and /OR Viva Voice)**
AECC1	**English Communication**	**Theory (Without Practical) (Without Tutorial)**	**2**	**100**	**40**	**0**	**0**	**100**	**No ESE (Practical and /OR Viva Voice)**
Legend: **MSE→ Mid Semester Examination** **ESE→ End Semester Examination**									

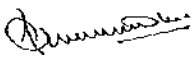
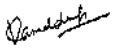
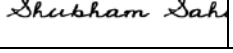
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Lecture Scheme: English Communication Ability Enhancement Compulsory Course(AECC)					
Credits	**Paper Type**	**Lectures per Semester**	**Lectures per Week**	**Assignment**	**Tutorial**
2	**Theory (without Practical) (without Tutorials)**	**30**	**3**	**0**	**0**

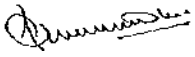
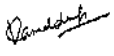
Course Objective	
The subject aims to provide the student with	
SL. No.	**Objective**
1.	**To expose the students with communicative English as a tool for making professional career.**
2.	**To expose the students with various skills sets by sensitizing them to the dynamics of body language.**
3.	**To equip students effectively to acquire skills in reading, writing, comprehension and communication, as also to use electronic media for English Communication.**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

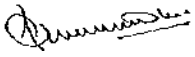
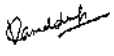
Course Learning Outcome	
After completion of this course students will be able to:	
COs	Outcome
CO1	Acquire correct usage of communicative English through vocabulary building, grammar and pronunciation.
CO2	Improve good listening skills.
CO3	Learning the phonetic alphabet.
CO4	Strengthen the ability to be creative in written communication.
CO5	Increase reading speed and comprehension.

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

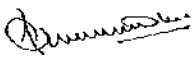
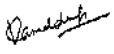
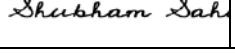
Instruction to Examiners / Question Setters and Marking Scheme for Mid Semester and End Semester Examination
Mid Semester Examination • No Mid Semester Examination
End Semester Examination • There will be TWO Group of Questions. • Group A is compulsory and will contain THREE Questions. • Question Number 1 will be Very Short Answer Type Question consisting of TEN QUESTIONS of 1 Marks each. • Question Number 2 and Question Number 3 will be Short Answer Type Questions of 5 Marks each. • Group B will contain Descriptive Type SIX Questions of 20 Marks each, out of which any FOUR Questions are to be answered. **Note: There may be subdivisions in each question asked in Theory Examinations.**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Course Contents: English Communication as Ability Enhancement Compulsory Course–I(AECC–I) i.e. AECC–I		
Unit	**Course Contents**	**Lectures**
1.	**Communication: –** **Definition, Stages, Barriers, Types: Verbal and Non-Verbal, Listening- Meaning, Nature and importance, Principles of Good Listening.**	**12**
2.	**Class-presentation (Oral for five minutes) on any of the above-mentioned topics: –** **Descriptive Writing, Expansion of an Idea.**	**6**
3.	**Writing Skills: –** **Notice writing, Advertisement Writing, Précis Writing, Essay Writing, Letter Writing (applications), Business Letter Formats (Letters of Enquiry, Replies and Complaints), Resume Writing, Covering Letter .**	**8**
4.	**Vocabulary Building: –** **One Word Substitution, Synonyms and Antonyms, Idioms and Phrases.**	**4**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Text / Reference Books	
SL. No.	**Details of Book**
1.	Technical Communication, M.H. Rizvi, Tata McGraw-Hill
2.	Effective Business Communication, Asha Kaul
3.	Developing Communication Skills, Krishnamohan
4.	Functional Grammar and Spoken and Written Communication in English, Bikram K. Das, Orient Blackswan
5.	Precis, Paraphrase and Summary, P.N. Gopalkrishnan, Authors Press.
Note: Latest edition of text books may be used.	

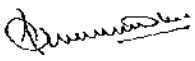
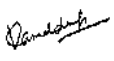
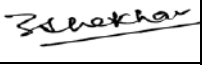
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

II. Statistics [Statistical Methods] as Generic Elective 1A(GE1A) i.e. GE1A

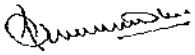
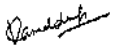
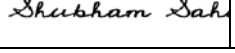
Statistics as Generic Elective 1A(GE1A) i.e. GE1A									
Paper Code	**Paper Name**	**Paper Type**	**Total Credits**	**Full Marks**	**Pass Marks**	**Attendance**	**MSE**	**ESE (Theory)**	**ESE (Practical and /OR Viva Voice)**
GE1A	**Statistics [STATISTICAL METHODS]**	**Theory (without Practical) (with Tutorial)**	**6**	**100**	**40**	**0**	**0**	**100**	**No ESE (Practical and /OR Viva Voice)**
Legend: **MSE→ Mid Semester Examination** **ESE→ End Semester Examination**									

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

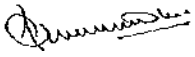
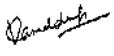
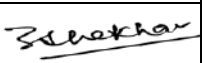
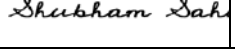
Lecture Scheme: Statistics [Statistical Methods] as Generic Elective 1A(GE1A) i.e. GE1A						
Credits	Paper Type	Lectures per Semester		Lectures per Week		Tutorial
		Theory	Practical	Theory	Practical	
6	Theory (without Practical) (with Tutorial)	75	0	6	0	1

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

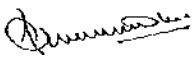
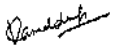
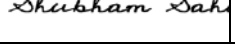
Instruction to Examiners / Question Setters and Marking Scheme for Mid Semester and End Semester Examination
Mid Semester Examination • No Mid Semester Examination
End Semester Examination • There will be TWO Group of Questions. • Group A is COMPULSORY and will contain THREE Questions. • Question Number 1 will be Very Short Answer Type Question consisting of TEN Sub Questions of 1 Marks each. • Question Number 2 and Question Number 3 will be Short Answer Type Questions of 5 Marks each. • Group B will contain Descriptive Type SIX Questions of 20 Marks each, out of which any FOUR Questions are to be answered. **Note:** There may be sub divisions in each question asked in Theory Examinations.

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Course Contents: Statistics [STATISTICAL METHODS] as Generic Elective 1A(GE1A) Theory i.e. GE1A		
Unit	**Course Contents**	**Lectures**
1.	**Introduction:** Definition and scope of Statistics, concepts of statistical population and sample. Data: quantitative and qualitative, attributes, variables, scales of measurement - nominal, ordinal, interval and ratio. Presentation: tabular and graphic, including histogram and ogives.	20
2.	**Measures of Central Tendency:** Mathematical and positional. Measures of Dispersion: range, quartile deviation, mean deviation, standard deviation, coefficient of variation, moments, skewness and kurtosis.	18
3.	**Bivariate Data:** Definition, scatter diagram, Karl Pearson product moment correlation coefficient and its properties, rank correlation. Simple linear regression, principle of least squares and fitting of polynomials and exponential curves.	17
4.	**Theory of Attributes** Consistency of data, independence and association of attributes, measures of association and contingency.	20

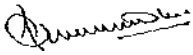
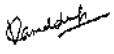
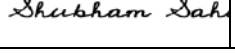
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Text / Reference Books	
SL. No.	**Details of Book**
1.	**Goon A.M., Gupta M.K. and Dasgupta B. (2002): Fundamentals of Statistics, Vol. I & II, 8th Edn. The World Press, Kolkata.**
2.	**Miller, Irwin and Miller, Marylees (2006): John E. Freund's Mathematical Statistics with Applications, (7th Edition), Pearson Education, Asia.**
3.	**Mood, A.M. Graybill, F.A. and Boes, D.C. (2007): Introduction to the Theory of Statistics, 3rd Edition, (Reprint), Tata McGraw-Hill Pub. Co. Ltd.**
4.	**Fundamentals of Mathematical Statistics , S. C. Gupta & V.K. Kapoor**

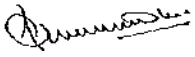
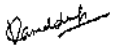
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

III. Mathematics [Differential Calculus and Coordinate Geometry 2D] as Generic Elective 1B(GE1B) i.e. GE1B

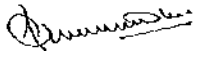
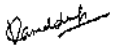
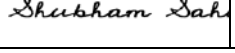
Mathematics [Differential Calculus and Coordinate Geometry 2D] as Generic Elective 1B(GE1B) i.e. GE1B									
Paper Code	**Paper Name**	**Paper Type**	**Total Credits**	**Full Marks**	**Pass Marks**	**Attendance**	**MSE**	**ESE (Theory)**	**ESE (Practical and /OR Viva Voice)**
GE1B	**Mathematics [Differential Calculus and Coordinate Geometry 2D]**	**Theory (without Practical) (with Tutorial)**	**6**	**100**	**40**	**0**	**0**	**100**	**No ESE (Practical and /OR Viva Voice)**
Legend: **MSE→ Mid Semester Examination** **ESE→ End Semester Examination**									

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

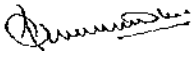
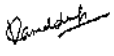
Lecture Scheme: Mathematics [Differential Calculus and Coordinate Geometry 2D] as Generic Elective 1B(GE1B) i.e. GE1B						
Credits	Paper Type	Lectures per Semester		Lectures per Week		Tutorial
		Theory	Practical	Theory	Practical	
6	Theory (without Practical) (with Tutorial)	75	0	6	0	1

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

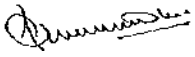
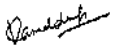
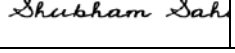
Instruction to Examiners / Question Setters and Marking Scheme for Mid Semester and End Semester Examination
Mid Semester Examination • No Mid Semester Examination
End Semester Examination • There will be TWO Group of Questions. • Group A is COMPULSORY and will contain THREE Questions. • Question Number 1 will be Very Short Answer Type consisting of TEN Sub Questions of 1 Marks each. • Question Number 2 and Question Number 3 will be Short Answer Type of 5 Marks each. • Group B will contain Descriptive Type SIX Questions of 20 Marks each, out of which any FOUR Questions are to be answered. **Note:** There may be sub divisions in each question asked in Theory Examinations.

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Course Contents: Mathematics [Differential Calculus and Coordinate Geometry 2D] as Generic Elective 1B(GE1B) Theory i.e. GE1B		
Unit	**Course Contents**	**Lectures**
1.	**Differential Calculus** **Successive Differentiation, n^{th} order Derivative of Standard Function. Leibnitz's Theorem. Taylor's and Maclaurin's series expansions of functions. Applications of Taylor's Series and Maclaurin's Series. Tangent and Normal, (Cartesian, Parametric form), Angle between two Curves. Length of tangent, Normal, Sub Tangent, Subnormal in Cartesian Forms. Partial Differentiation, Euler's' Theorem, Curvature. Asymptotes. Maxima and Minima of Functions of two Variables.**	**50**
2.	**Coordinate Geometry 2D** **Change of Rectangular Axes, Rotation and Shifting of Origin, Transformation of General Equation of the Second Degree. Conditions for General Equation of Second Degree to Represent a Parabola, Ellipse and Hyperbola. Equations of the Tangent and Normal to a Curve via calculus. Polar Equation.**	**25**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Text / Reference Books	
SL. No.	**Details of Book**
1.	**Differential Calculus: A Das Gupta & S B Prasad.**
2.	**Differential Calculus: Lalji Prasad**
3.	**Coordinate Geometry: A Das Gupta**
4.	**Coordinate Geometry: Lalji Prasad**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

IV. Programming using C/C++ as Core Course 1(CC1)

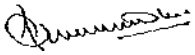
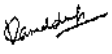
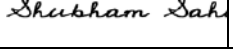
Programming using C/C++ as Core Course 1(CC1)									
Paper Code	**Paper Name**	**Paper Type**	**Total Credits**	**Full Marks**	**Pass Marks**	**Attendance**	**MSE**	**ESE (Theory)**	**ESE (Practical and /OR Viva Voce)**
CC1	**Programming using C/C++**	**Theory (with Practical) (without Tutorial)**	**6**	**100**	**40**	**0**	**15**	**60**	**25**
Legend: **MSE→ Mid Semester Examination** **ESE→ End Semester Examination**									

Lecture Scheme: Programming using C/C++ as Core Course 1(CC1)						
Credits	**Paper Type**	**Lectures per Semester**		**Lectures per Week**		**Tutorial**
		Theory	**Practical**	**Theory**	**Practical**	
6	**Theory (with Practical) (without Tutorial)**	**60**	**60**	**6**	**6**	**0**

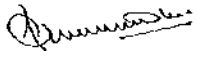
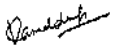
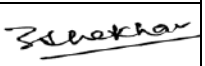
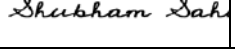
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Course Objective	
The subject aims to provide the student with	
SL. No.	Objective
1.	An understanding of basic concepts programming.
2.	An introduction to the fundamentals of C language.
3.	An understanding of problem solving approaches and programs.
4.	An understanding about control structures.
5.	An understanding about different data types.

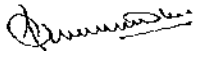
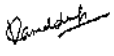
Course Learning Outcome	
After completion of this course students will be able to:	
COs	Outcome
CO1	Explain the flowcharts and algorithms.
CO2	Explain the working and implementation of Array.
CO3	Demonstrate the benefits and use of Functions and Pointers.
CO4	Explain the working derived data types like structures, unions, classes etc.
CO5	Explain the working of inheritance and polymorphism.

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

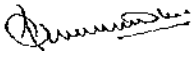
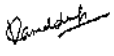
Instruction to Examiners / Question Setters and Marking Scheme for Mid Semester and End Semester Examination
Theory
Mid Semester Examination • There will be TWO Group of Questions. • Group A is COMPULSORY and will contain FIVE Questions of Very Short Answer Type Questions consisting of 1 Marks each. • Group B will contain Descriptive Type THREE Questions of Five Marks each, out of which any TWO Questions are to be answered.
End Semester Examination • There will be TWO Group of Questions. • Group A is COMPULSORY and will contain THREE Questions. • Question Number 1 will be Very Short Answer Type Questions consisting of Five Sub Questions of 1 Marks each. • Question Number 2 and Question Number 3 will be Short Answer Type Questions of 5 Marks each. • Group B will contain Descriptive Type FIVE Questions of 15 Marks each, out of which any THREE are to be answered. **Note:** There may be sub divisions in each question asked in Theory Examinations.

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Instruction to Examiners / Question Setters and Marking Scheme for Mid Semester and End Semester Examination	
Practical and Viva Voce	
Mid Semester Examination • **No Mid Semester Examination**	
End Semester Examination	
Lab: **Student have to Answer the given questions on Answer booklet and execute the answered programs/steps in computer with standard output.**	
Assignment: **The Assignment should be hand written in A4 Size Paper. First three pages (i.e. front page, acknowledgment, index) & Bibliography may be printout.**	
Questions: **There will be Four Questions from the Respective Core Paper in Practical Examination, out of which any TWO is to be answered.**	
Distribution of Marks	
Lab (Experiment + Answer Script)	**15**
Assignment	**5**
Viva Voce	**5**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Course Contents: Programming using C/C++ as Core Course 1(CC1) Theory i.e. CC1		
Unit	**Course Contents**	**Lectures**
1.	**Introduction to C and C++** **History of C and C++, Overview of Procedural Programming and Object-Orientation Programming, Using main() function, Compiling and Executing Simple Programs in C++.**	**3**
2.	**Data Types, Variables, Constants, Operators and Basic I/O** **Declaring, Defining and Initializing Variables, Scope of Variables, Using Named Constants,** **Keywords, Data Types, Casting of Data Types, Operators (Arithmetic, Logical and Bitwise),** **Using Comments in programs, Character I/O (getc, getchar, putc, putcharetc), Formatted and Console I/O (printf(), scanf(), cin, cout), Using Basic Header Files (stdio.h, iostream.h,** **conio.h etc.)**	**5**
3.	**Expressions, Conditional Statements and Iterative Statements** **Simple Expressions in C++ (including Unary Operator Expressions, Binary Operator Expressions), Understanding Operators Precedence in Expressions, Conditional Statements (if construct, switchcase construct), Understanding syntax and utility of Iterative Statements (while, do-while, and for loops),**	**5**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

	Use of break and continue in Loops, Using Nested Statements (Conditional as well as Iterative)	
4.	**Functions and Arrays** **Functions** **Utility of functions, Call by Value, Call by Reference, Functions returning value, Void functions, Inline Functions, Return data type of functions, Functions parameters, Differentiating between Declaration and Definition of Functions, Command Line Arguments/Parameters in Functions, Functions with variable number of Arguments.** **Array** **Creating and Using One Dimensional Arrays (Declaring and Defining an Array, Initializing an Array, Accessing individual elements in an Array, Manipulating array elements using loops), Use Various types of arrays (integer, float and character arrays / Strings) Two-dimensional Arrays (Declaring, Defining and Initializing Two Dimensional Array, Working with Rows and Columns), Introduction to Multi-dimensional arrays**	**10**
5.	**Derived Data Types (Structures and Unions)** **Understanding utility of structures and unions, Declaring, initializing and using simple structures and unions, Manipulating individual members of structures and unions, Array of Structures, Individual data members as structures, Passing and returning structures from**	**3**

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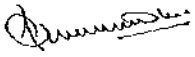
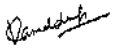
	functions, Structure with union as members, Union with structures as members.	
6.	**Pointers and References in C++ Understanding a Pointer Variable, Simple use of Pointers (Declaring and Dereferencing Pointers to simple variables), Pointers to Pointers, Pointers to structures, Problems with Pointers, passing pointers as function arguments, Returning a pointer from a function, using arrays as pointers, Passing arrays to functions. Pointers vs. References, Declaring and initializing references, Using references as function arguments and function return values**	**7**
7.	**Memory Allocation in C++ Differentiating between static and dynamic memory allocation, use of malloc, calloc and free functions, use of new and delete operators, storage of variables in static and dynamic memory allocation**	**3**
8.	**File I/O, Preprocessor Directives Opening and closing a file (use of fstream header file, ifstream, ofstream and fstream classes), Reading and writing Text Files, Using put(), get(), read() and write() functions, Random access in files, Understanding the Preprocessor Directives (#include, #define, #error, #if, #else, #elif, #endif, #ifdef, #ifndef and #undef), Macros**	**4**
9.	**Using Classes in C++ Principles of Object-Oriented Programming, Defining & Using Classes, Class Constructors,**	**7**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
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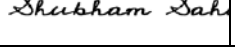
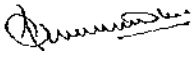
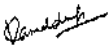
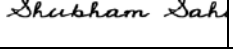
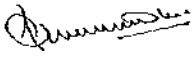
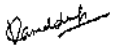
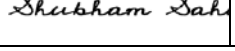
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

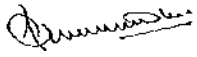
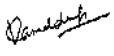
	Constructor Overloading, Function overloading in classes, Class Variables &Functions, Objects as parameters, Specifying the Protected and Private Access, Copy Constructors, Overview of Template classes and their use	
10.	**Overview of Function Overloading and Operator Overloading** **Need of Overloading functions and operators, overloading functions by number and type of arguments, looking at an operator as a function call, Overloading Operators (including assignment operators, unary operators)**	**5**
11.	**Inheritance, Polymorphism and Exception Handling** **Introduction to Inheritance (Multi-Level Inheritance, Multiple Inheritance), Polymorphism (Virtual Functions, Pure Virtual Functions), Basics Exceptional Handling (using catch and throw, multiple catch statements), Catching all exceptions, Restricting exceptions, Rethrowing exceptions.**	**8**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

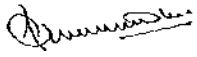
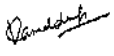
Text / Reference Books	
SL. No.	**Details of Book**
1.	**Herbtz Schildt, "C++: The Complete Reference", Fourth Edition, McGraw Hill.2003**
2.	**Bjarne Stroustrup, "The C++ Programming Language", 4th Edition, Addison-Wesley, 2013.**
3.	**Bjarne Stroustroup, "Programming -- Principles and Practice using C++", 2nd Edition, Addison-Wesley 2014**
4.	**E Balaguruswamy, "Object Oriented Programming with C++"**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Course Contents: Programming using C/C++ as Core Course 1(CC1) Practical i.e. CC1 Lab	
Program	**Course Contents**
	Section I
1.	WAP to print the sum and product of digits of an integer.
2.	WAP to reverse a number.
3.	WAP to compute the sum of the first n terms of the following series S = 1+1/2+1/3+1/4+……
4.	WAP to compute the sum of the first n terms of the following series S =1-2+3-4+5…….
5.	Write a function that checks whether a given string is Palindrome or not. Use this function to find whether the string entered by user is Palindrome or not.
6.	Write a function to find whether a given no. is prime or not. Use the same to generate the prime numbers less than 100.
7.	WAP to compute the factors of a given number.
8.	Write a macro that swaps two numbers. WAP to use it.
9.	WAP to print a triangle of stars as follows (take number of lines from user): * *** ***** ******* *********
10.	WAP to perform following actions on an array entered by the user:

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

	a. Print the even-valued elements b. Print the odd-valued elements c. Calculate and print the sum and average of the elements of array d. Print the maximum and minimum element of array e. Remove the duplicates from the array f. Print the array in reverse order
Section II	
1.	WAP to perform following actions on an array entered by the user: a. Print the even-valued elements b. Print the odd-valued elements c. Calculate and print the sum and average of the elements of array d. Print the maximum and minimum element of array e. Remove the duplicates from the array f. Print the array in reverse order
2.	WAP that prints a table indicating the number of occurrences of each alphabet in the text entered as command line arguments.
3.	Write a program that swaps two numbers using pointers.
4.	Write a program in which a function is passed address of two variables and then alter its contents.
5.	Write a program which takes the radius of a circle as input from the user, passes it to another function that computes the area and the circumference of the circle and displays

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
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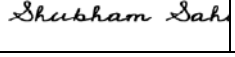
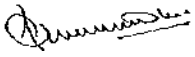
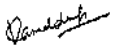
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

	the value of area and circumference from the main() function.
6.	**Write a program to find sum of n elements entered by the user. To write this program, allocate memory dynamically using malloc() / calloc() functions or new operator.**
7.	**Write a menu driven program to perform following operations on strings:**
8.	**Given two ordered arrays of integers, write a program to merge the two-arrays to get an ordered array.**
9.	**WAP to display Fibonacci series** **a. using recursion** **b. using iteration**
10.	**WAP to calculate Factorial of a number** **a. using recursion** **b. using iteration**
11.	**WAP to calculate GCD of two numbers** **a. with recursion** **b. without recursion**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
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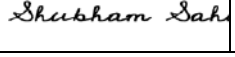
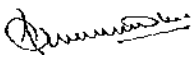
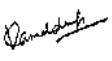
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

V. Computer System Architecture as Core Course 2(CC2)

Computer System Architecture as Core Course 2(CC2) i.e. CC2									
Paper Code	**Paper Name**	**Paper Type**	**Total Credits**	**Full Marks**	**Pass Marks**	**Attendance**	**MSE**	**ESE (Theory)**	**ESE (Practical and /OR Viva Voce)**
CC2	**Computer System Architecture**	**Theory (With Practical) (Without Tutorial)**	**6**	**100**	**40**	**0**	**15**	**60**	**25**
Legend: **MSE→ Mid Semester Examination** **ESE→ End Semester Examination**									

Lecture Scheme: Computer System Architecture as Core Course 2(CC2) i.e. CC2						
Credits	**Paper Type**	**Lectures per Semester**		**Lectures per Week**		**Tutorial**
		Theory	**Practical**	**Theory**	**Practical**	
6	**Theory (with Practical) (without Tutorial)**	**60**	**60**	**6**	**6**	**0**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
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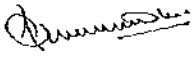
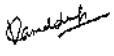
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Course Objective	
The subject aims to provide the student with	
SL. No.	Objective
1.	Understand the basic organization of a computer system and its functional units.
2.	Analyze different number systems such as binary, decimal, octal and hexadecimal, and apply arithmetic algorithms.
3.	Examine memory hierarchy, CPU memory interaction, cache memory, and related mapping,
4.	Evaluate different parallel processing techniques.
5.	Analyze characteristic of multiprocessors, interconnection structures, interprocessor arbitration, inter processor communication.

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
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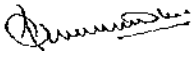
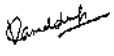
Course Learning Outcome	
After completion of this course students will be able to:	
COs	Outcome
CO1	Students will be able to understand the functional units of a computer system and describe the instruction codes and cycles involved in computer instructions.
CO2	Students will be able to perform arithmetic operations using different number systems
CO3	Students will be able to explain the memory hierarchy and the interaction between CPU and memory
CO4	Students will be able to describe parallel processing and pipelining, including arithmetic pipelining, instruction pipeline.
CO5	Students will be able to evaluate the characteristics of multiprocessors, including interconnection structures, interprocessor arbitration, interprocessor communication, and synchronization

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
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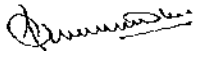
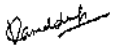
Instruction to Examiners / Question Setters and Marking Scheme for Mid Semester and End Semester Examination
Theory
Mid Semester Examination • There will be TWO Group of Questions. • Group A is COMPULSORY and will contain FIVE Questions of Very Short Answer Type Questions consisting of 1 Marks each. • Group B will contain Descriptive Type THREE Questions of Five Marks each, out of which any TWO Questions are to be answered.
End Semester Examination • There will be TWO Group of Questions. • Group A is COMPULSORY and will contain THREE Questions. • Question Number 1 will be Very Short Answer Type Questions consisting of Five Sub Questions of 1 Marks each. • Question Number 2 and Question Number 3 will be Short Answer Type Questions of 5 Marks each. • Group B will contain Descriptive Type FIVE Questions of 15 Marks each, out of which any THREE are to be answered. **Note:** There may be sub divisions in each question asked in Theory Examinations.

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
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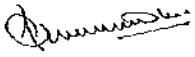
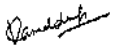
Instruction to Examiners / Question Setters and Marking Scheme for Mid Semester and End Semester Examination	
Practical and Viva Voce	
Mid Semester Examination • **No Mid Semester Examination**	
End Semester Examination	
Lab: **Student have to Answer the given questions on Answer booklet and execute the answered programs/steps in computer with standard output.**	
Assignment: **The Assignment should be hand written in A4 Size Paper. First three pages (i.e. front page, acknowledgment, index) & Bibliography may be printout.**	
Questions: **There will be Two Questions from the Respective Core Paper in Practical Examination, out of which any TWO is to be answered.**	
Distribution of Marks	
Lab (Experiment + Answer Script)	**15**
Assignment	**5**
Viva Voce	**5**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
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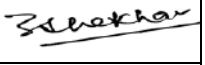
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
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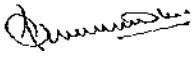
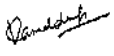
Course Contents: Computer System Architecture as Core Course 2(CC2) Theory i.e. CC2		
Unit	**Course Contents**	**Lectures**
1.	**Introduction** Basics of computer- Definition, Characteristics, Classification, Parts and block diagram of a digital computer, Logic gates, basic logic operations, truth tables, Boolean algebra, simplification of Boolean expression by applying Boolean Theorem and Karnaugh Map (K-Map up to 4 variables), Sum of products, product of sums and canonical forms.	8
2.	**Data Representation and Basic Computer Arithmetic** Number System – Different types of number systems (i.e. Decimal, binary, octal, hexadecimal), conversion of numbers from one Number system to the other, binary arithmetic, (r-1)'s & r's complement representation, subtraction using r's and (r-1)'s complement, signed and unsigned numbers, Fixed and Floating point representation of numbers. Code Conversion-BCD (Binary Coded Decimal), Gray Code and ASCII, BCD-to-Binary Conversion, Binary-to-Gray conversion, Gray-to-Binary conversion, Error detection and Correction Codes (Parity method for error detection and Hamming error detection code).	10
3.	**Basic Computer Organization and Design** Computer Registers, Bus System, Instruction Set, Timing and Control, Instruction Cycle, Memory Reference, Input – Output and Interrupt, Interconnection Structures, Bus Interconnection Design of Basic Computer.	13
4.	**Central Processing Unit** Microprocessors – Definition, Features and Architecture of	15

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
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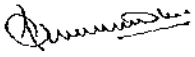
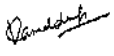
	8085 microprocessor, Register Organization, Timing and control unit of 8085, Pin diagram of 8085, Addressing modes of 8085, DMA (Direct Memory Access) **Instruction set – Instruction formats (Memory, Register and Input/Output), Classification of 8085 instructions (Data Transfer, Arithmetic, logical and Branch instructions), Types of instructions (Three address, two address, one address and zero address). micro programmed control. Machine language, assembly language, Assembly instructions for Comparing & Branching, RISC, CISC architectures, pipelining and parallel architecture.**	
5.	**Memory Organization** **Concept of Memory Hierarchy Organization, Cache Memory, Semiconductor Memory (RAM and ROM), Magnetic Memory (Magnetic disks i.e. Hard disks and floppy disks, Magnetic tapes, Optical disks),Associative memory, Mapping Functions:-Associative Mapping, Direct Mapping, Set-Associative Mapping.**	**6**
6.	**Input – Output Organization** **Input / Output: External Devices, I/O Modules, Programmed I/O, Interrupt-Driven I/O, Direct Memory Access, I/O Channels.**	**8**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
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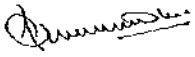
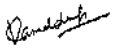
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Text / Reference Books	
SL. No.	**Details of Book**
1.	M. Mano, Computer System Architecture, Pearson Education 1992
2.	A. J. Dos Reis, Assembly Language and Computer Architecture using C++ and JAVA, Course Technology, 2004
3.	W. Stallings, Computer Organization and Architecture Designing for Performance, 8 Edition, Prentice Hall of India, 2009.
4.	M.M. Mano , Digital Design, Pearson Education Asia,2013
5.	B Ram, Computer Organization, Eighth edition,

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
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Course Contents: Computer System Architecture as Core Course 2(CC2) Practical i.e. CC2 Lab

Program	Course Contents
1.	Create a machine based on the following architecture:

Register Set

IR	DR	AC	AR	PC	FGI	FGO	S	I	E
0 15	0 15	0 15	011	011	1 Bit	1 Bit	1 Bit	1 Bit	1 Bit

Memory	Instruction Format			
4096 words 16 bits per word	0	3	4	15
	Opcode		Address	

Basic Computer Instructions

Memory Reference			Register Reference		Input - Output	
Symbol		Hex	Symbol	Hex	Symbol	Hex
AND	0xxx	Direct Addressing	CLA	E800	INP	F800
AND	2xxx		CLE	E400	OUT	F400
LDA	4xxx		CMA	E200	SKI	F200
STA	6xxx		CME	E100	SKO	F100
BUN	8xxx		CIR	E080	ION	F080
BSA	Axxx		CLE	E040	IOF	F040
ISZ	Cxxx		INC	E020		

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	AND_I	1xxx	Indirect Addressing	SPA	E010		
	AND_I	3xxx		SNA	E008		
	LDA_I	5xxx		SZA	E004		
	STA_I	7xxx		SZE	E002		
	BUN_I	9xxx		HLT	E001		
	BSA_I	Bxxx					
	ISZ_I	Dxxx					
	Refer to Chapter-5 of Morris Mano for Description of instructions						
2.	Create the micro operations and associate with instructions as given in the chapter (except interrupts). Design the register set, memory and the instruction set. Use this machine for the assignments of this section.						
3.	Create a Fetch routine of the instruction cycle.						
4.	Simulate the machine to determine the contents of AC, E, PC, AR and IR registers in hexadecimal after the execution of each of following register reference instructions: a. CLA b. CLE c. CMA d. CME e. CIR f. CIL g. INC h. SPA i. SNA j. SZA k. HLT Initialize the contents of AC to (A937)16, that of PC to (022)16 and E to 1.						
5.	Simulate the machine for the following memory-reference instructions with I= 0 and address part = 082. The instruction to be stored at address						

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

<table>
<tr><td></td><td>022 in RAM. Initialize the memory word at address 082 with the operand B8F2 and AC with A937. Determine the contents of AC, DR, PC, AR and IR in hexadecimal after the execution.
a. ADD
b. AND
c. LDA
d. STA
e. BUN</td></tr>
<tr><td>6.</td><td>Simulate the machine for the memory-reference instructions referred in above question with I= 1 and address part = 082. The instruction to be stored at address 026 in RAM. Initialize the memory word at address 082 with the value 298. Initialize the memory word at address 298 with operand B8F2 and AC with A937. Determine the contents of AC, DR, PC, AR and IR in hexadecimal after the execution.</td></tr>
<tr><td>7.</td><td>Modify the machine created in Practical 1 according to the following instruction format:

<table>
<tr><th colspan="5">Instruction Format</th></tr>
<tr><td>0</td><td colspan="2">2</td><td>3</td><td>4 15</td></tr>
<tr><td colspan="2">Opcode</td><td colspan="2">I</td><td>Address</td></tr>
</table>

a. The instruction format contains a 3-bit opcode, a 1-bit addressing mode and a 12-bit address. There are only two addressing modes, I = 0 (direct addressing) and I = 1 (indirect addressing).
b. Create a new register I of 1 bit.
c. Create two new microinstructions as follows:
i. Check the opcode of instruction to determine type of instruction (Memory Reference/Register Reference/Input-Output) and then jump accordingly.</td></tr>
</table>

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
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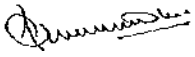
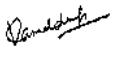
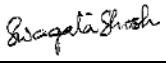
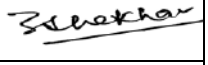
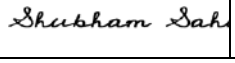
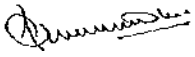
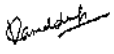
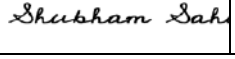
	ii. Check the I bit to determine the addressing mode and then jump accordingly.

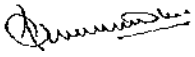
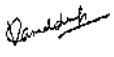
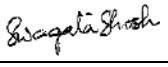
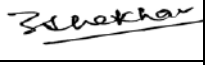
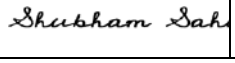
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

VI. Core Course Practical 1(CP1): CC1 Lab and CC2 Lab

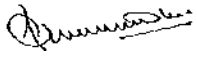
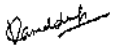
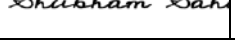
Core Course Practical 1(CP1)									
Paper Code	Paper Name	Paper Type	Total Credits	Full Marks	Pass Marks	MSE	Assignment	ESE (Lab (Experiment + Answer script))	Viva Voce
CC1 Lab	Programming using C/C++ Lab	Practical	2	25		0	5	15	5
CC2 Lab	Computer System Architecture Lab	Practical	2	25	40	0	5	15	5
CP1		Practical	4	50	40	0	10	30	10
Legend: MSE→ Mid Semester Examination ESE→ End Semester Examination									

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

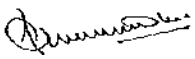
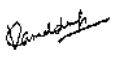
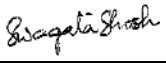
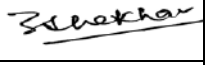
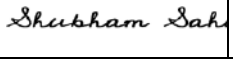
Lecture Scheme: Core Course Practical 1(CP1):						
Credits	Paper Type	Lectures per Semester		Lectures per Week		Tutorial
		Theory	Practical	Theory	Practical	
4	Practical (with Theory) (without Tutorial)	60 + 60	60 + 60	6 + 6	6 + 6	0 + 0

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Core Course Practical 1(CP1): CC1 Lab and CC2 Lab Instruction to Examiners / Question Setters and Marking Scheme for Mid Semester and End Semester Examination	
Mid Semester Examination • No Mid Semester Examination	
End Semester Examination • There will be TWO GROUPS of Questions in Practical Examination of 3 Hours. • Group A: Questions from Core Paper 1(CC1) will contain FOUR Questions, out of which any TWO Questions are to be answered. • Group B: Questions from Core Paper 2(CC2) will contain TWO Questions, out of which any ONE Question is to be answered.	
Lab: Student have to Answer the given questions on Answer booklet and execute the answered programs/steps in computer with standard output.	
Assignment: The Assignment should be hand written in A4 size paper. First three pages (i.e. front page + acknowledgment + index) & Bibliography may be printout.	
Marks Distribution:	
Lab (Experiment + Answer Script)	**30 Marks (15 Marks + 15 Marks)**
Assignment	**10 Marks (5 marks + 5 Marks)**
Viva Voce	**10 Marks (5 marks + 5 Marks)**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

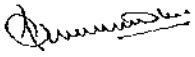
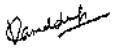
Second Semester

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

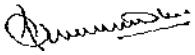
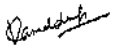
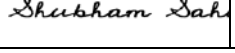
I. Environmental Studies as Ability Enhancement Compulsory Course (AECC) i.e. AECC2

Environmental Studies as Ability Enhancement Compulsory Course(AECC) i.e. AECC2									
Paper Code	**Paper Name**	**Paper Type**	**Total Credits**	**Full Marks**	**Pass Marks**	**Attendance**	**MSE**	**ESE (Theory)**	**ESE (Practical and /OR Viva Voice)**
AECC2	**Environmental Studies**	**Theory (Without Practical) (Without Tutorial)**	**2**	**100**	**40**	**0**	**0**	**100**	**No ESE (Practical and /OR Viva Voice)**
Legend: **MSE→ Mid Semester Examination** **ESE→ End Semester Examination**									

Lecture Scheme: Environmental Studies as Ability Enhancement Compulsory Course(AECC) i.e. AECC2					
Credits	**Paper Type**	**Lectures per Semester**	**Lectures per Week**	**Assignment**	**Tutorial**
2	**Theory (without Practical) (without Tutorials)**	**30**	**3**	**0**	**0**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

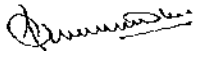
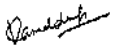
Course Objective	
The subject aims to provide the student with	
SL. No.	Objective
1.	The course seeks to equip students with the ability to apply the acquired knowledge, skills, attitudes, and values required to take appropriate actions for mitigating the effects of environmental degradation, climate change, and pollution, effective waste management, conservation of biological diversity, management of biological resources, forest and wildlife conservation, and sustainable development and living.
2.	The course will also deepen the knowledge and understanding of India's environment in its totality, its interactive processes, and its effects on the future quality of people's lives.
3.	This course underlines the importance of making environmental education an integral part of curricula and encouraging environmental awareness and sensitivity towards its conservation and sustainable development.

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

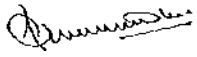
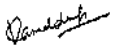
Course Learning Outcome	
After completion of this course students will be able to:	
COs	Outcome
CO1	Appreciate the historical context of human interactions with the environment.
CO2	Gain insights into the international efforts to safeguard the Earth's environment and resources
CO3	Understand the concept of natural resources; and their conservation and management.
CO4	Develop a critical understanding of ecosystems, biodiversity
CO5	Develop an understanding of pollution and its types and sensitize themselves to adverse health impacts of pollution.
CO6	Gain a comprehensive knowledge of climate change, its science and response measures and have an overview of national and global efforts to address climate change adaptation and mitigation.
CO7	Develop a critical understanding of the complexity of environmental management.
CO8	Learn about how the nations of the world work together for the environment by understanding about the major international treaties and our country's stand on and responses to the major international agreements.

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Instruction to Examiners / Question Setters and Marking Scheme for Mid Semester and End Semester Examination
Mid Semester Examination • No Mid Semester Examination
End Semester Examination • There will be TWO Group of Questions. • Group A is COMPULSORY and will contain THREE Questions. • Question Number 1 will be Very Short Answer Type Question consisting of TEN Sub Questions of 1 Marks each. • Question Number 2 and Question Number 3 will be Short Answer Type Questions of 5 Marks each. • Group B will contain Descriptive Type SIX Questions of 20 Marks each, out of which any FOUR Questions are to be answered. **Note:** There may be subdivisions in each question asked in Theory Examinations.

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Course Contents: Environmental Studies as Ability Enhancement Compulsory Course(AECC2) Theory i.e. AECC2		
Unit	**Course Contents**	**Lectures**
1.	Introduction to Environmental Studies Multidisciplinary nature of environmental studies; Scope and importance; Concept of sustainability and sustainable development.	2
2.	Ecosystems What is an ecosystem? Structure and function of ecosystem; Energy flow in an ecosystem: food chains, food webs and ecological succession. Case studies of the following ecosystems: • Forest Ecosystem • Grassland Ecosystem • Desert Ecosystem • Aquatic Ecosystems ➢ Ponds ➢ Streams ➢ Lakes ➢ Rivers ➢ Oceans ➢ Estuaries	
3.	Natural Resources: Renewable and Non – Renewable Resources Land Resources and land use change; Land degradation, soil erosion and desertification. Deforestation:	5

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

	Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations. **Water:** **Use and over--exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter--state).** **Energy Resources:** **Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs, case studies.**	
4.	**Biodiversity and Conservation** **Levels of Biological Diversity: Genetic, Species and Ecosystem diversity; Biogeographic Zones of India; Biodiversity Patterns and Global Biodiversity Hot Spots, India as a Mega Biodiversity Nation; Endangered and Endemic Species of India** **Threats to Biodiversity: Habitat Loss, Poaching of Wildlife, Man – Wildlife Conflicts, Biological Invasions;** **Conservation of Biodiversity: In – situ and Ex – situ Conservation of Biodiversity** **Ecosystem and Biodiversity Services: Ecological, Economic, Social, Ethical, Aesthetic and Informational Value.**	**5**
5.	**Environmental Pollution** **Environmental pollution: Types, Causes, Effects and Controls; Air, Water, Soil and Noise**	**5**

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Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
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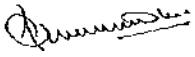
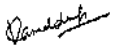
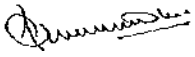
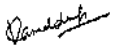
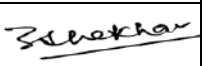
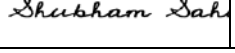
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

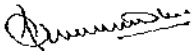
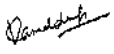
	Pollution **Nuclear Hazards and Human Health Risks** **Solid Waste Management: Control Measures of Urban and Industrial Waste** **Pollution Case Studies**	
6.	**Environmental Policies & Practices** **Climate Change, Global Warming, Ozone Layer Depletion, Acid Rain and Impacts on Human Communities and Agriculture** **Environment Laws: Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and Control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act.** **International Agreements: Montreal and Kyoto protocols and Convention on Biological Diversity (CBD).** **Nature Reserves, Tribal Populations and Rights, and Human Wildlife Conflicts in Indian Context.**	**4**
7.	**Human Communities and the Environment** **Human population growth: Impacts on environment, human health and welfare.** **Resettlement and rehabilitation of project affected persons; case studies.** **Disaster Management: Floods, Earthquake, Cyclones and Landslides.** **Environmental Movements: Chipko, Silent valley, Bishnois of Rajasthan.**	**3**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

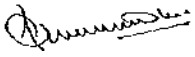
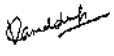
	Environmental Ethics: Role of Indian and other Religions and Cultures in Environmental Conservation. **Environmental Communication and Public Awareness, Case Studies (e.g. CNG Vehicles in Delhi).**	
8.	**Field work** **Visit to an area to document environmental assets: river/ forest/ flora/fauna, etc. Visit to a local polluted site--Urban/Rural/Industrial/Agricultural. Study of common plants, insects, birds and basic principles of identification. Study of simple ecosystems--pond, river, Delhi Ridge, etc.**	**4**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Text / Reference Books	
SL. No.	**Details of Book**
1.	Raziuddin, M.., Mishra P.K. 2014, A Handbook of Environmental Studies, Akanaksha Publications, Ranchi.
2.	Mukherjee, B. 2011: Fundamentals of Environmental Biology.Silverline Publications, Allahabad.
3.	Carson, R. 2002. Silent Spring. Houghton Mifflin Harcourt.
4.	Gadgil, M., & Guha, R.1993. This Fissured Land: An Ecological History of India. Univ. of California Press.
5.	Gleeson, B. and Low, N. (eds.) 1999.Global Ethics and Environment, London, Routledge.
6.	Gleick, P. H. 1993. Water in Crisis. Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ. Press.
7.	Groom, Martha J., Gary K. Meffe, and Carl Ronald Carroll.Principles of Conservation Biology. Sunderland: Sinauer Associates, 2006.
8.	Grumbine, R. Edward, and Pandit, M.K. 2013. Threats from India's Himalaya dams. Science, 339: 36-37.
9.	McCully, P. 1996. Rivers no more: the environmental effects of dams(pp. 29---64). Zed Books.
10.	McNeill, John R. 2000. Something New Under the Sun: An Environmental History of the Twentieth Century.
11.	Odum, E.P., Odum, H.T. & Andrews, J. 1971.Fundamentals of Ecology. Philadelphia: Saunders.

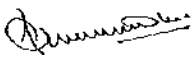
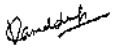
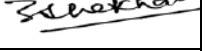
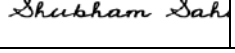
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

12.	Pepper, I.L., Gerba, C.P. & Brusseau, M.L. 2011. Environmental and Pollution Science. Academic Press.
13.	Rao, M.N. & Datta, A.K. 1987. Waste Water Treatment. Oxford and IBH Publishing Co. Pvt. Ltd.
14.	Raven, P.H., Hassenzahl, D.M. & Berg, L.R. 2012.Environment. 8th edition. John Wiley & Sons.
15.	Rosencranz, A., Divan, S., & Noble, M. L. 2001. Environmental law and policy in India. Tripathi 1992.
16.	Sengupta, R. 2003. Ecology and economics: An approach to sustainable development. OUP.
17.	Singh, J.S., Singh, S.P. and Gupta, S.R. 2014. Ecology, Environmental Science and Conservation. S. Chand Publishing, New Delhi.
18.	Sodhi, N.S., Gibson, L. & Raven, P.H. (eds). 2013. Conservation Biology: Voices from the Tropics. John Wiley & Sons.
19.	Thapar, V. 1998. Land of the Tiger: A Natural History of the Indian Subcontinent.
20.	Warren, C. E. 1971. Biology and Water Pollution Control. WB Saunders.
21.	Wilson, E. O. 2006.The Creation: An appeal to save life on earth. New York: Norton.
22.	World Commission on Environment and Development. 1987. Our Common Future. Oxford University
Note: Latest edition of text books may be used.	

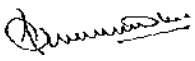
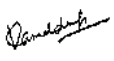
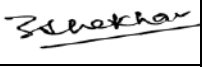
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

II. Statistics [Introductory Probability] as Generic Elective 2A(GE2A) i.e. GE2A

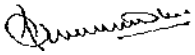
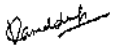
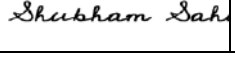
Generic Elective Course 2A(GE2A) i.e. GE2A									
Paper Code	**Paper Name**	**Paper Type**	**Total Credits**	**Full Marks**	**Pass Marks**	**Attendance**	**MSE**	**ESE (Theory)**	**ESE (Practical and /OR Viva Voice)**
GE2A	**Statistics [Introductory Probability]**	**Theory (Without Practical) (With Tutorial)**	**6**	**100**	**40**	**0**	**0**	**100**	**No ESE (Practical and /OR Viva Voice)**
Legend: **MSE→ Mid Semester Examination** **ESE→ End Semester Examination**									

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

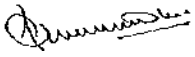
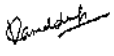
Lecture Scheme: Statistics [Introductory Probability] as Generic Elective Course 2A(GE2A) i.e. STATGE2A						
Credits	Paper Type	Lectures per Semester		Lectures per Week		Tutorial
		Theory	Practical	Theory	Practical	
6	Theory (without Practical) (with Tutorial)	75	0	6	0	1

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

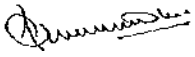
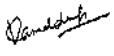
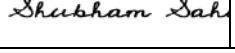
Instruction to Examiners / Question Setters and Marking Scheme for Mid Semester and End Semester Examination
Mid Semester Examination • No Mid Semester Examination
End Semester Examination • There will be TWO Group of Questions. • Group A is COMPULSORY and will contain THREE Questions. • Question Number 1 will be Very Short Answer Type Question consisting of TEN Sub Questions of 1 Marks each. • Question Number 2 and Question Number 3 will be Short Answer Type Questions of 5 Marks each. • Group B will contain Descriptive Type SIX Questions of 20 Marks each, out of which any FOUR Questions are to be answered. **Note:** There may be subdivisions in each question asked in Theory Examinations.

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Course Contents: Statistics [INTRODUCTORY PROBABILITY] as Generic Elective 2A(GE2A) Theory i.e. GE2A		
Unit	**Course Contents**	**Lectures**
1.	**Probability:** Introduction, Random Experiments, Sample Space, Events and Algebra of Events. Definitions of Probability – classical, statistical, and axiomatic. Conditional Probability, Laws of Addition and Multiplication, Independent Events, Theorem of Total Probability, Bayes' Theorem and its Applications. [3 Questions]	18
2.	**Random Variables:** Discrete and Continuous Random Variables, p.m.f., p.d.f., c.d.f. Illustrations of Random Variables and its Properties. Two Dimensional Random Variables: Discrete and Continuous Type, Joint, Marginal and Conditional p.m.f. and p.d.f. [3 Questions]	17
3.	**Mathematical Expectation:** Mathematical Expectation, Variance, Moments and Moment Generating Function. Chebyshev's Inequality, De-Moivre Laplace and Lindeberg-Levy Central Limit Theorem (C.L.T.). [3 Questions]	20
4.	**Standard Probability Distributions:** Uniform(Discrete), Binomial, Poisson, Geometric, Uniform(Continuous), Normal, Exponential. [3 Questions]	20

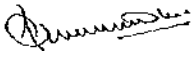
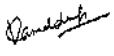
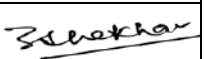
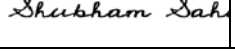
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Text / Reference Books	
SL. No.	**Details of Book**
1.	**Hogg, R.V., Tanis, E.A. and Rao J.M. (2009): Probability and Statistical Inference, Seventh Edition, Pearson Education, New Delhi.**
2.	**Miller, Irwin and Miller, Marylees (2006): John E. Freund's Mathematical Statistics with Applications, (7th Edition), Pearson Education, Asia.**
3.	**Myer, P.L. (1970): Introductory Probability and Statistical Applications, Oxford & IBH Publishing, New Delhi**
4.	**Fundamentals of Mathematical Statistics , S. C. Gupta & V.K. Kapoor.**

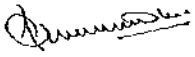
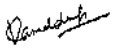
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

III. Mathematics [INTEGRAL CALCULUS, VECTOR CALCULUS AND TRIGONOMETRY] as Generic Elective 2B(GE2B) i.e. GE2B

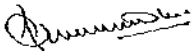
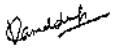
Mathematics [INTEGRAL CALCULUS, VECTOR CALCULUS AND TRIGONOMETRY] as Generic Elective 2B(GE2B) i.e. GE2B									
Paper Code	**Paper Name**	**Paper Type**	**Total Credits**	**Full Marks**	**Pass Marks**	**Attendance**	**MSE**	**ESE (Theory)**	**ESE (Practical and /OR Viva Voice)**
GE2B	**Mathematics**	**Theory (Without Practical) (With Tutorial)**	**6**	**100**	**40**	**0**	**0**	**100**	**No ESE (Practical and /OR Viva Voice)**
Legend: **MSE→ Mid Semester Examination** **ESE→ End Semester Examination**									

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

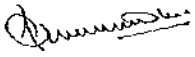
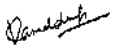
Lecture Scheme: Mathematics [INTEGRAL CALCULUS, VECTOR CALCULUS AND TRIGONOMETRY] as Generic Elective 2B(GE2B) i.e. GE2B						
Credits	Paper Type	Lectures per Semester		Lectures per Week		Tutorial
		Theory	Practical	Theory	Practical	
6	Theory (without Practical) (with Tutorial)	75	0	6	0	1

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

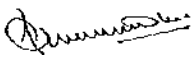
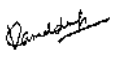
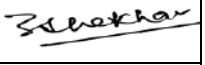
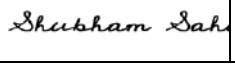
Instruction to Examiners / Question Setters and Marking Scheme for Mid Semester and End Semester Examination
Mid Semester Examination • **No Mid Semester Examination**
End Semester Examination • **There will be TWO Group of Questions.** • **Group A is COMPULSORY and will contain THREE Questions.** • **Question Number 1 will be Very Short Answer Type Question consisting of TEN Sub Questions of 1 Marks each.** • **Question Number 2 and Question Number 3 will be Short Answer Type Questions of 5 Marks each.** • **Group B will contain Descriptive Type SIX Questions of 20 Marks each, out of which any FOUR Questions are to be answered.** **Note:** **There may be sub divisions in each question asked in Theory Examinations.**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Course Contents: Mathematics [INTEGRAL CALCULUS, VECTOR CALCULUS AND TRIGONOMETRY] as Generic Elective 2B(GE2B) Theory i.e. GE2B		
Unit	**Course Contents**	**Lectures**
1.	**INTEGRAL CALCULUS** **Integration of Rational and Irrational Functions, Partial Fractions, Integration by Transformation, Integration by Substitution, Integration by Parts.** **Evaluation of Definite Integrals, Reduction Formulae, Curve Tracing, Length and Area, Surface Area and Volume of Solids of Revolution.**	**45**
2.	**VECTOR CALCULUS & TRIGONOMETRY** **Scalar Vector Calculus and Vector Point Functions, Vector Function of Scalar Variables, Continuity of a vector function. Differentiation of a vector with respect to the scalar variable. Differentiation of a vector function.** **Derivatives of a sum of vectors, Derivatives of a product of vectors (both Scalar and Vector Products). Gradient, Divergence and Curl and Second Order Vector Differential Operators in Cartesian coordinates systems.** **DeMoivre's Theorem and Applications**	**30**

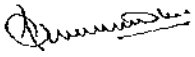
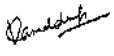
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Text / Reference Books	
SL. No.	**Details of Book**
1.	Integral Calculus: Dasgupta & Prasad
2.	Integral Calculus: Lalji Prasad
3.	Vector Calculus: Dasgupta & Prasad
4.	Vector Calculus: Lalji Prasad
5.	Trigonometry: Dasgupta & Prasad
6.	Trigonometry: Lalji Prasad

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

IV. Data Structure using C as Core Course 3(CC3)

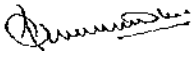
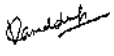
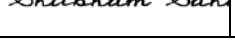
Data Structure using C as Core Course 3(CC3) Theory i.e. CC3									
Paper Code	**Paper Name**	**Paper Type**	**Total Credits**	**Full Marks**	**Pass Marks**	**Attendance**	**MSE**	**ESE (Theory)**	**ESE (Practical and /OR Viva Voice)**
CC3	**Data Structure using C**	**Theory (With Practical) (Without Tutorial)**	**6**	**100**	**40**	**0**	**15**	**60**	**25**
Legend: **MSE→ Mid Semester Examination** **ESE→ End Semester Examination**									

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

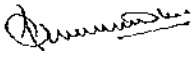
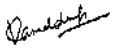
Lecture Scheme: Data Structure using C as Core Course 3(CC3) i.e. CC3						
Credits	Paper Type	Lectures per Semester		Lectures per Week		Tutorial
		Theory	Practical	Theory	Practical	
6	Theory (with Practical) (without Tutorial)	60	60	6	6	0

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Course Objective	
The subject aims to provide the student with	
SL. No.	Objective
1.	To provide the knowledge of basic data structures and their implementations.
2.	To understand importance of data structures in context of writing efficient programs.
3.	To develop skills to apply appropriate data structures in problem solving.
4.	To develop the skill to develop searching skills.
5.	To develop the skills to different types of data structures.

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Course Learning Outcome	
After completion of this course students will be able to:	
COs	**Outcome**
CO1	**Understand and apply the concept of Abstract Data Types (ADTs) for representing complex data structures such as rational numbers, stacks, queues, matrices, linked lists, and trees.**
CO2	**Demonstrate proficiency in implementing various operations on data structures including insertion, deletion, traversal, and search for efficient and effective data processing.**
CO3	**Analyze and compare the pros and cons of various tree representations such as adjacency matrix and adjacency list for solving real-world problems.**
CO4	**Apply different sorting algorithms such as bubble sort, selection sort, quicksort, and merge sort for efficient data organization and retrieval.**
CO5	**Design and implement basic graph algorithms such as Depth First Search and Breadth First Search for analyzing graphs and solving problems in areas such as social networks, transportation, and logistics**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
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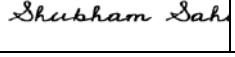
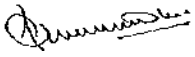
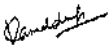
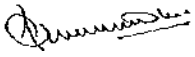
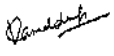
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

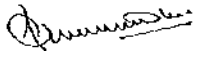
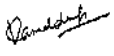
Instruction to Examiners / Question Setters and Marking Scheme for Mid Semester and End Semester Examination
Theory
Mid Semester Examination • There will be TWO Group of Questions. • Group A is COMPULSORY and will contain FIVE Questions of Very Short Answer Type Questions consisting of 1 Marks each. • Group B will contain Descriptive Type THREE Questions of Five Marks each, out of which any TWO Questions are to be answered.
End Semester Examination • There will be TWO Group of Questions. • Group A is COMPULSORY and will contain THREE Questions. • Question Number 1 will be Very Short Answer Type Questions consisting of Five Sub Questions of 1 Marks each. • Question Number 2 and Question Number 3 will be Short Answer Type Questions of 5 Marks each. • Group B will contain Descriptive Type FIVE Questions of 15 Marks each, out of which any THREE are to be answered. **Note:** There may be sub divisions in each question asked in Theory Examinations.

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Instruction to Examiners / Question Setters and Marking Scheme for Mid Semester and End Semester Examination	
Practical and Viva Voce	
Mid Semester Examination • **No Mid Semester Examination**	
End Semester Examination	
Lab: **Student have to Answer the given questions on Answer booklet and execute the answered programs/steps in computer with standard output.**	
Assignment: **The Assignment should be hand written in A4 Size Paper.** **First three pages (i.e. front page, acknowledgment, index) & Bibliography may be printout.**	
Questions: **There will be Four Questions from the Respective Core Paper in Practical Examination, out of which any TWO is to be answered.**	
Distribution of Marks	
Lab (Experiment + Answer Script)	**15**
Assignment	**5**
Viva Voce	**5**

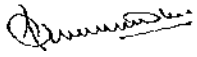
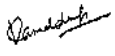
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Course Contents: Data Structure using C as Core Course 3(CC3) Theory i.e. CC3		
Unit	**Course Contents**	**Lectures**
1.	**Arrays** Single and Multi-dimensional Arrays, Sparse Matrices (Array and Linked Representation)	5
2.	**Stacks** Implementing single / multiple stack/s in an Array; Prefix, Infix and Postfix expressions, Utility and conversion of these expressions from one to another; Applications of stack; Limitations of Array representation of stack	5
3.	**Linked Lists** Singly, Doubly and Circular Lists (Array and Linked representation); Normal and Circular representation of Stack in Lists; Self Organizing Lists; Skip Lists	10
4.	**Queues** Array and Linked representation of Queue, De-queue, Priority Queues	5
5.	**Recursion** Developing Recursive Definition of Simple Problems and their implementation; Advantages and Limitations of Recursion; Understanding what goes behind Recursion (Internal Stack	5
6.	**Trees** Introduction to Tree as a data structure; Binary Trees (Insertion, Deletion, Recursive and Iterative Traversals on Binary Search Trees); Threaded Binary Trees	20

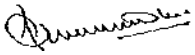
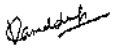
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

	(Insertion, Deletion, Traversals); Height Balanced Trees (Various operations on AVL Trees).	
7.	**Searching and Sorting** **Linear Search, Binary Search, Comparison of Linear and Binary Search, Selection Sort, Insertion Sort, Insertion Sort, Shell Sort, Comparison of Sorting Techniques**	**5**
8.	**Hashing** **Introduction to Hashing, Deleting from Hash Table, Efficiency of Rehash Methods, Hash Table Reordering, Resolving collusion by Open Addressing, Coalesced Hashing, Separate Chaining, Dynamic and Extendible Hashing, Choosing a Hash Function, Perfect Hashing Function**	**5**

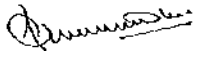
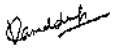
Text / Reference Books	
SL. No.	**Details of Book**
1.	**Data Structures using C", by Y. Kanetkar.**
2.	**Data structure by R.B Patel**
3.	**Data structures using C by A.M Padma Reddy**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Course Contents: Data Structure using C as Core Course 3(CC3) Practical i.e. CC3 Lab	
Program	**Course Contents**
	Section I
1.	**Write a program to search an element from a list. Give user the option to perform Linear or Binary search. Use Template functions.**
2.	**WAP using templates to sort a list of elements. Give user the option to perform sorting using Insertion sort, Bubble sort or Selection sort.**
3.	**Implement Linked List using templates. Include functions for insertion, deletion and search of a number, reverse the list and concatenate two linked lists (include a function and also overload overload+).**
4.	**Implement Doubly Linked List using templates. Include functions for insertion, deletion and search of a number, reverse the list.**
5.	**Implement Circular Linked List using templates. Include functions for insertion, deletion and search of a number, reverse the list.**
6.	**Perform Stack operations using Linked List implementation.**
7.	**Perform Stack operations using Array implementation. Use Templates.**
8.	**Perform Queues operations using Circular Array implementation. Use Templates.**
9.	**Create and perform different operations on Double-ended Queues using Linked List implementation.**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

10.	**WAP to calculate factorial and to compute the factors of a given number** **a. using recursion** **b. using iteration**
11.	**WAP to display Fibonacci Series** **a. using recursion** **b. using iteration**
12.	**WAP to calculate GCD of 2 number** **a. with recursion** **b. without recursion**
13.	**WAP to create a Binary Search Tree and include following operations in tree:** **a. Insertion (Recursive and Iterative Implementation)** **b. Deletion by copying** **c. Deletion by Merging** **d. Search a no. in BST** **e. Display its preorder, postorder and inorder traversals Recursively** **f. Display its preorder, postorder and inorder traversals Iteratively** **g. Display its level-by-level traversals** **h. Count the non-leaf nodes and leaf nodes** **i. Display height of tree** **j. Create a mirror image of tree** **k. Check whether two BSTs are equal or no**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
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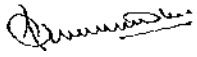
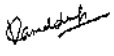
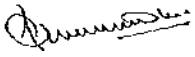
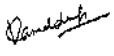
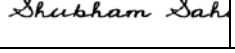
V. Discrete Structure as Core Course 4(CC4)

Discrete Structure as Core Course 4(CC4)									
Paper Code	Paper Name	Paper Type	Total Credits	Full Marks	Pass Marks	Attendance	MSE	ESE (Theory)	ESE (Practical and /OR Viva Voice)
CC4	Discrete Structure	Theory (With Practical) (With Tutorial)	6	100	40	0	15	60	25
Legend: MSE→ Mid Semester Examination ESE→ End Semester Examination									

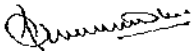
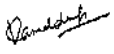
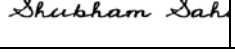
Discrete Structure as Core Course 4(CC2)						
Credits	Paper Type	Lectures per Semester		Lectures per Week		Tutorial
		Theory	Practical	Theory	Practical	
6	Theory (with Practical) (without Tutorial)	60	60	6	6	0

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

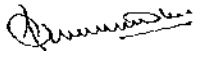
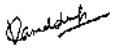
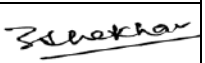
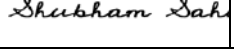
Course Objective	
The subject aims to provide the student with	
SL. No.	Objective
1.	To make the students understand the basic concepts of some Mathematical topics related to different branch of Applied Sciences (e.g. Data & Computer Science).
2.	To give insights about the applications of those Mathematical topics in different branch of Applied Sciences.
3.	To helps the students to understand correct lines of arguments and proofs.
4.	To help students understand mathematical techniques that are foundations for understanding advanced computational methods, including numerical methods and optimization.
5.	To help students understand various problem-solving strategies and methods to tackle both theoretical and practical challenges in computer science.

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

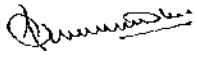
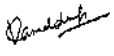
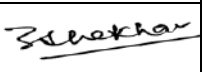
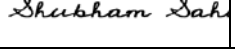
Course Learning Outcome	
After completion of this course students will be able to:	
COs	Outcome
CO1	Describe and interpret the concept of set theory, functions, matrices, linear equations, differentiation and integration.
CO2	Apply the concept and techniques of matrices and system of linear equations in the different branch of applied sciences that requires such concepts.
CO3	Describe the differentiation and integration and its uses.
CO4	Interpret the applicability of Multivariable Calculus and its thermos to apply in real words
CO5	Develop an understanding on the concepts of Graph theory.

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Instructions to Examiners / Question Setters and Marking Scheme for Mid Semester and End Semester Examination
Theory
Mid Semester Examination • There will be TWO Group of Questions. • Group A is COMPULSORY and will contain FIVE Questions of Very Short Answer Type Questions consisting of 1 Marks each. • Group B will contain Descriptive Type THREE Questions of Five Marks each, out of which any TWO Questions are to be answered.
End Semester Examination • There will be TWO Group of Questions. • Group A is COMPULSORY and will contain THREE Questions. • Question Number 1 will be Very Short Answer Type Questions consisting of Five Sub Questions of 1 Marks each. • Question Number 2 and Question Number 3 will be Short Answer Type Questions of 5 Marks each. • Group B will contain Descriptive Type FIVE Questions of 15 Marks each, out of which any THREE are to be answered. **Note:** There may be sub divisions in each question asked in Theory Examinations.

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

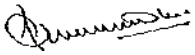
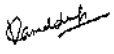
Instruction to Examiners / Question Setters and Marking Scheme for Mid Semester and End Semester Examination	
Practical and Viva Voce	
Mid Semester Examination • **No Mid Semester Examination**	
End Semester Examination	
Lab: **Student have to Answer the given questions on Answer booklet and execute the answered programs/steps in computer with standard output.**	
Assignment: **The Assignment should be hand written in A4 Size Paper.** **First three pages (i.e. front page, acknowledgment, index) & Bibliography may be printout.**	
Questions: **There will be Four Questions from the Respective Core Paper in Practical Examination, out of which any TWO is to be answered.**	
Distribution of Marks	
Lab (Experiment + Answer Script)	**15**
Assignment	**5**
Viva Voce	**5**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

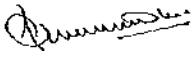
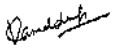
Course Contents: Discrete Structure as Core Course 4(CC4) Theory i.e. CC4		
Unit	**Course Contents**	**Lectures**
1.	**Introduction** Introduction to Sets ,Operations on Sets ,Basic Operations , Properties Common to Logic and Sets , Relations and Cartesian Product, Relations and their Types , Property of Relations, Functions ,Operations on Functions	15
2.	**Growth of Functions:** Asymptotic Notations, Summation formulas and properties, Bounding Summations, approximation by Integrals	8
3.	**Recurrences:** Recurrence Relations, generating functions, Linear Recurrence Relations with constant coefficients and their solution, Substitution Method, Recurrence Trees, Master Theorem	10
4.	**Graph Theory:** Basic Terminology, Models and Types, multigraphs and weighted graphs, Graph Representation, Graph Isomorphism, Connectivity, Euler and Hamiltonian Paths and Circuits, Planar Graphs, Graph Coloring, Trees, Basic Terminology and properties of Trees, Introduction to Spanning Trees	15
5.	**Prepositional Logic:** Logical Connectives, Well-Formed Formulas, Tautologies, Equivalences	12

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Text / Reference Books	
SL. No.	**Details of Book**
1.	**C.L. Liu , D.P. Mahopatra, Elements of Discrete Mathematics, 2nd Edition , Tata McGraw Hill, 1985.**
2.	**Kenneth Rosen, Discrete Mathematics and Its Applications, Sixth Edition ,McGraw Hill 2006.**
3.	**T.H. Coremen, C.E. Leiserson, R. L. Rivest, Introduction to algorithms, 3rd edition Prentice Hall on India, 2009.**
4.	**M. O. Albertson and J. P. Hutchinson, Discrete Mathematics with Algorithms , John Wiley Publication, 1988.**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Course Contents: Discrete Structure as Core Course 4(CC4) Practical i.e. CC4 Lab	
Program	**Course Contents**
1.	**Let p stand for the proposition "I bought a lottery ticket" and q for "I won the jackpot". Express the following as natural English sentences:** **a. ¬p** **b. p ∨ q** **c. p ∧ q** **d. p ⇒ q** **e. ¬p⇒ ¬q** **f. ¬p∨ (p∧q)**
2.	**Formalise the following in terms of atomic propositions R, B, and W, first making clear how they correspond to the English text.** **a. Berries are ripe along the path, but rabbits have not been seen in the area.** **b. Rabbits have not been seen in the area, and walking on the path is safe, but berries are ripe along the path.** **c. If berries are ripe along the path, then walking is safe if and only if rabbits have not been seen in the area.** **d. It is not safe to walk along the path, but rabbits have not been seen in the area and the berries along the path are ripe.**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

	e. For walking on the path to be safe, it is necessary but not sufficient that berries not be ripe along the path and for rabbits not to have been seen in the area. Walking is not safe on the path whenever rabbits have been seen in the area and berries are ripe along the path.
3.	Formalise these statements and determine (with truth tables or otherwise) whether they are consistent (i.e. if there are some assumptions on the atomic propositions that make it true): "The system is in a multiuser state if and only if it is operating normally. If the system is operating normally, the kernel is functioning. Either the kernel is not functioning or the system is in interrupt mode. If the system is not in multiuser state, then it is in interrupt mode. The system is not in interrupt mode."
4.	When is a propositional formula Pvalid? When is Psatisfiable?
5.	For each of the following propositions, construct a truth table and state whether the proposition is valid or satisfiable. (For brevity, you can just write one truth table with many columns.) a. $p \wedge \neg p$ b. $p \vee \neg p$ c. $(p \vee \neg q) \Rightarrow q$ d. $(p \vee q) \Rightarrow (p \wedge q)$ e. $(p \Rightarrow q) \Leftrightarrow (\neg q \Rightarrow \neg p)$ f. $(p \Rightarrow q) \Rightarrow (q \Rightarrow p)$

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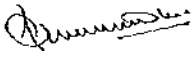
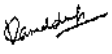
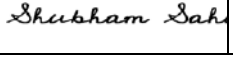
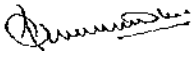
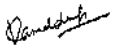
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

VI. Core Course Practical 2(CP2): CC3 Lab and CC4 Lab

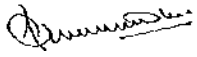
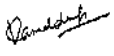
Core Course Practical 2(CP2) CC3 Lab and CC4 Lab									
Paper Code	Paper Name	Paper Type	Total Credits	Full Marks	Pass Marks	MSE	Assignment	ESE (Lab (Experiment + Answer script))	Viva Voce
CC3 Lab	Data Structure using C Lab	Practical	2	25		0	5	15	5
CC4 Lab	Discrete Structure Lab	Practical	2	25	40	0	5	15	5
CP2		Practical	4	50	40	0	10	30	10
Legend: MSE→ Mid Semester Examination ESE→ End Semester Examination									

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Lecture Scheme: Core Course Practical 2(CP2): CC3 Lab and CC4 Lab						
Credits	Paper Type	Lectures per Semester		Lectures per Week		Tutorial
		Theory	Practical	Theory	Practical	
4	Practical (with Theory) (without Tutorial)	60 + 60	60 + 60	6 + 6	6 + 6	0 + 0

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Core Course Practical 2(CP2): CC3 Lab and CC4 Lab Instruction to Examiners / Question Setters and Marking Scheme for Mid Semester and End Semester Examination	
Mid Semester Examination • No Mid Semester Examination	
End Semester Examination • There will be TWO GROUPS of Questions in Practical Examination of 3 Hours. • Group A: Questions from Core Paper 3(CC3) will contain FOUR Questions, out of which any TWO Questions are to be answered. • Group B: Questions from Core Paper 4(CC4) will contain TWO Questions, out of which any ONE Question is to be answered.	
Lab: Student have to Answer the given questions on Answer booklet and execute the answered programs/steps in computer with standard output.	
Assignment: The Assignment should be hand written in A4 size paper. First three pages (i.e. front page + acknowledgment + index) & Bibliography may be printout.	
Marks Distribution:	
Lab (Experiment + Answer Script)	**30 Marks (15 Marks + 15 Marks)**
Assignment	**10 Marks (5 marks + 5 Marks)**
Viva Voce	**10 Marks (5 marks + 5 Marks)**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
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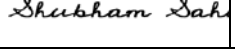
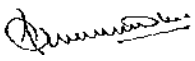
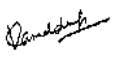
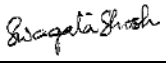
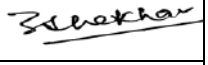
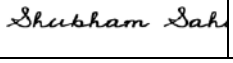
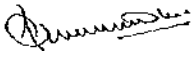
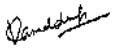
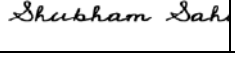
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Third Semester

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

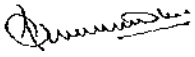
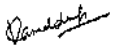
I. Introduction to Android Programming as Skill Enhancement Course1(SEC1) i.e. SEC1

Introduction to Android Programming as Skill Enhancement Course1(SEC1) i.e. SEC1									
Paper Code	**Paper Name**	**Paper Type**	**Total Credits**	**Full Marks**	**Pass Marks**	**Attendance**	**MSE**	**ESE (Theory)**	**ESE (Practical and /OR Viva Voice)**
SEC1	**Introduction to Android Programming**	**Theory (with Practical) (Without Tutorial)**	**2**	**100**	**40**	**0**	**0**	**100**	**No ESE (Practical and /OR Viva Voice)**
Legend: **MSE→ Mid Semester Examination** **ESE→ End Semester Examination**									

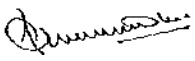
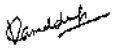
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Lecture Scheme: Introduction to Android Programming as Skill Enhancement Course1(SEC1) i.e. SEC1							
Credits	Paper Type	Lectures per Semester		Lectures per Week		Assignment	Tutorial
		Theory	Practical	Theory	Practical		
2	Theory (with Practical) (without Tutorials)	15	30	1	4	0	0

Course Objective	
The subject aims to provide the student with	
SL. No.	Objective
1.	To understand the Android based systems.
2.	To understand the basic requirements of android based programming.
3.	To understand the basic features of android based programming.
4.	To understand the connectivity of android based system with database.
5.	The objective of the course is to generate qualified manpower in the area of Information Technology (IT) and Graphic designing which will enable such person to work seamlessly at any Offices, whether Govt. or Private or for future entrepreneurs in the field of IT.

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Course Learning Outcome	
After completion of this course students will be able to:	
COs	Outcome
CO1	Demonstrate the Understanding of fundamental of Android Programming.
CO2	Build their ability to develop software with reasonable complexity on mobile platform.
CO3	Discover the life cycles of Activities, Applications, intents and fragments.
CO4	Design the Android apps by using Java Concepts.
CO5	Design the Android based mobile applications.

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
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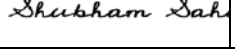
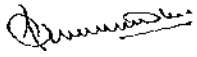
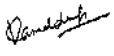
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Instruction to Examiners / Question Setters and Marking Scheme for Mid Semester and End Semester Examination
Mid Semester Examination • No Mid Semester Examination
End Semester Examination • There will be TWO Group of Questions. • Group A is COMPULSORY and will contain THREE Questions. • Question Number 1 will be Very Short Answer Type Question consisting of TEN Sub Questions of 1 Marks each. • Question Number 2 and Question Number 3 will be Short Answer Type Questions of 5 Marks each. • Group B will contain Descriptive Type SIX Questions of 20 Marks each, out of which any FOUR Questions are to be answered. **Note:** There may be sub divisions in each question asked in Theory Examinations.

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
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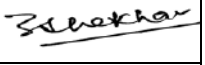
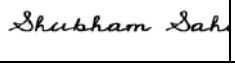
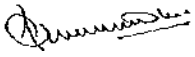
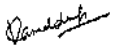
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Course Content: Elementary Computer Software and Introduction to Android Programming as Skill Enhancement Course1(SEC1) Theory i.e. SEC1A		
Unit	**Course Contents**	**Lectures**
1.	**Fundamentals of Android:** 1. OOPS Concept 2. SQL queries 3. Basics of Designing 4. Android Basics a. Installing Android Studio b. Creating an Android app project c. Deploying the app to an emulator and a device d. Layouts, Views and Resources e. Text and Scrolling views (working with TextView Elements) 5. PHP and HTML basics	5
2.	**Introduction to Android Operating System:** Activities and Intents 2. Activity Lifecycle and Saving State 3. Activities and Implicit Intents 4. Debugging Your App 5. Testing Your App 6. User Input Controls 7. Menus 8. Screen Navigation 9. Recycler View 10. Delightful User Experience	6

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
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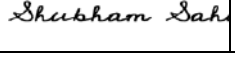
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

	a. Drawable, Themes and Styles b. Material design c. Supporting landscape, multiple screen sizes 11. AsyncTask and AsyncTaskLoader 12. Broadcast receivers 13. Notifications 14. Transferring data efficiently	
3.	Database Connectivity: 1. SQLite Data Types 2. Adding, Updating and Deleting Content using SQLite Database 3. 3. Working with MySQL	4

Text / Reference Books	
SL. No.	Details of Book
1.	Android: A Programming Guide by J. F. DiMarzio.
2.	Hello, Android: Introducing Google's Mobile Development Platform by Ed Burnett
3.	Programming android by Zigurd Mednieks
4.	Android User Interface Design: Turning Ideas and Sketches into Beautifully Designed Apps by Ian G. Clifton
5.	Android Developer Fundamental Course by Google.
6.	Advance Android Developer Course by Google.

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
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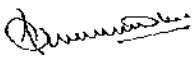
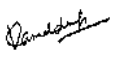
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Web Resources / Supplementary Resources	
1.	https://developer.android.com/index.html
2.	https://www.udemy.com
3.	http://nptel.ac.in/
4.	https://www.tutorialspoint.com/android/index.htm
5.	https://www.raywenderlich.com/category/android
6.	https://in.udacity.com/course/new-android-fundamentals--ud851

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
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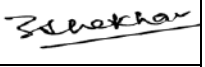
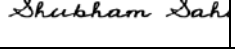
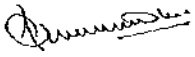
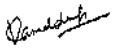
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Course Contents: Introduction to Android Programming as Skill Enhancement Course1(SEC1) Practical i.e. SEC1 Lab	
Unit	**Practicals**
1.	**HTML Basics**
2.	**PHP Basics**
3.	**Java Programming**
4.	**Install Android Studio and Run Hello World**
5.	**First Interactive UI**
6.	**Using different Layouts**
7.	**Working with Textview Elements**
8.	**Create and Start Activities**
9.	**Activity Lifecycle and Saving State**
10.	**Using the Debugger**
11.	**User Input Controls**
12.	**Menus**
13.	**Screen Navigation Using the App Bar and Tabs**
14.	**Create a RecyclerView**
15.	**Drawables, Themes and Styles**
16.	**Supporting landscape, multiple screen sizes**
17.	**Create an AsyncTask**
18.	**BroadcastReceiver**
19.	**Transferring data efficiently**
20.	**(Job Scheduler)**
21.	**Querying the SQLite database and the basics of SQLite and MySQL**
22.	**Adding,Updating and Deleting Content in APP using SQLite Database**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
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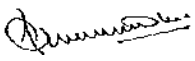
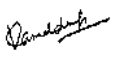
23.	**Use a loader with a content provider**
24.	**Send Data to Server using PHP and MySQL**
25.	**Publish Your App**
26.	**Project**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
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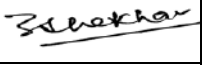
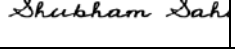
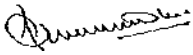
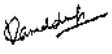
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

II. Statistics [Statistical Inference] as Generic Elective 3A(GE3A) i.e. GE3A

Statistics [Statistical Inference] as Generic Elective Course 3A(GE3A) i.e. GE3A									
Paper Code	Paper Name	Paper Type	Total Credits	Full Marks	Pass Marks	Attendance	MSE	ESE (Theory)	ESE (Practical and /OR Viva Voice)
GE3A	Statistics[Statistical Inference]	Theory (Without Practical) (with Tutorial)	6	100	40	0	0	100	No ESE (Practical and /OR Viva Voice)
Legend: MSE→ Mid Semester Examination ESE→ End Semester Examination									

Lecture Scheme: Statistics [Statistical Inference] as Generic Elective Course 3A(GE3A) i.e. STATGE3A						
Credits	Paper Type	Lectures per Semester		Lectures per Week		Tutorial
		Theory	Practical	Theory	Practical	
6	Theory (without Practical) (with Tutorial)	75	00	6	0	1

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
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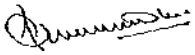
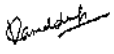
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Course Objective	
The subject aims to provide the student with	
SL. No.	Objective
1.	Gain insight regarding the population parameters from the observed data
2.	To introduce the concept of estimation theory and testing of hypothesis.
3.	To infer about the unknown population parameters based on random samples.
4.	To introduce the estimation/ inference about the population using hypothesis testing.
5.	The purpose of statistical inference to estimate the uncertainty or sample to sample variation.

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
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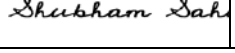
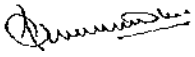
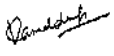
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Course Learning Outcome	
After completion of this course students will be able to:	
COs	Outcome
CO1	Gain insight regarding the population parameters from the observed data.
CO2	Estimate the sample to sample variation or uncertainty.
CO3	Provide estimates of unknown parameters from sample statistics.
CO4	Quantify the chance of obtaining a particular random sample result if the null hypothesis were true.
CO5	Understanding of estimation theory, Point and interval estimations.

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
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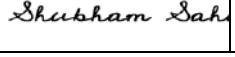
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

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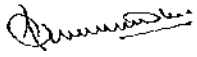
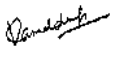
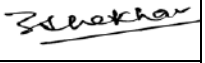
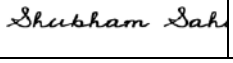
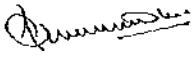
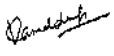
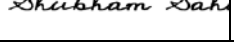
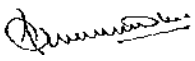
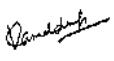
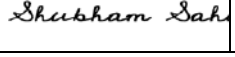
Mid Semester Examination • No Mid Semester Examination
End Semester Examination • There will be TWO Group of Questions. • Group A is COMPULSORY and will contain THREE Questions. • Question Number 1 will be Very Short Answer Type Question consisting of TEN Sub Questions of 1 Marks each. • Question Number 2 and Question Number 3 will be Short Answer Type Questions of 5 Marks each. • Group B will contain Descriptive Type SIX Questions of 20 Marks each, out of which any FOUR Questions are to be answered. **Note:** There may be sub divisions in each question asked in Theory Examinations.

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Course Contents: Statistics [Statistical Inference] as Generic Elective 3A(GE3A) Theory i.e. GE3A		
Unit	**Course Contents**	**Lectures**
1.	**Theory of Estimation and Testing of Hypothesis Estimation of Population mean, confidence intervals for the parameters of a normal distribution (one sample and two sample problems). The basic idea of significance test. Null and alternative hypothesis. Type I & Type II errors, level of significance. [3 Questions]**	**25**
2.	**Categorical Data: Tests of proportions, tests of association and goodness-of-fit using Chi- square test, Sign test, Wilcoxon two-sample test. [3 Questions]**	**18**
3.	**Analysis of Variance, one-way and two-way classification. Brief exposure of three basic principles of design of experiments, treatment, plot and block. Analysis of completely randomized design, randomized complete block design. [3 Questions]**	**20**
4.	**Index Numbers: Definition, Criteria for a good index number, different types of index numbers. Construction of index numbers of prices and quantities, consumer price index number. Uses and limitations of index numbers. [3 Questions]**	**12**

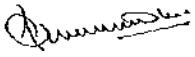
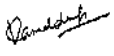
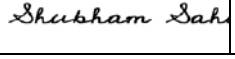
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Text / Reference Books	
SL. No.	**Text / Reference Book Details**
1.	**Daniel, Wayne W., Bio-statistics: A Foundation for Analysis in the Health Sciences. John Wiley (2005).**
2.	**Goon, A.M., Gupta M.K. & Das Gupta, Fundamentals of statistics, Vol.-I & II (2005).**
3.	**Dass, M. N. &Giri, N. C.: Design and analysis of experiments. John Wiley.**
4.	**Dunn, O.J Basic Statistics: A primer for the Biomedical Sciences .(1964, 1977) by John Wiley.**
5.	**Bancroft, Holdon Introduction to Bio-Statistics (1962) P.B. Hoebar New York.**
6.	**Goldstein, A Biostatistics-An introductory text (1971). The Macmillion New York.**
7.	**Fundamentals of Mathematical Statistics , S. C. Gupta & V.K. Kapoor**
8.	**Fundamentals of Applied Statistics , S. C. Gupta & V.K. Kapoor**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

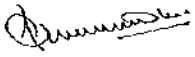
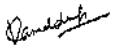
III. Mathematics [REAL ANALYSIS-I, GROUP THEORY AND DIFFERENTIAL EQUATIONS] as Generic Elective 3B(GE3B) i.e. GE3B

Mathematics [REAL ANALYSIS-I, GROUP THEORY AND DIFFERENTIAL EQUATIONS] as Generic Elective Course 3B(GE3B) i.e. GE3B									
Paper Code	**Paper Name**	**Paper Type**	**Total Credits**	**Full Marks**	**Pass Marks**	**Attendance**	**MSE**	**ESE (Theory)**	**ESE (Practical and /OR Viva Voice)**
GE3B	**Mathematics [REAL ANALYSIS-I, GROUP THEORY AND DIFFERENTIAL EQUATIONS]**	**Theory (Without Practical) (with Tutorial)**	**6**	**100**	**40**	**0**	**0**	**100**	**No ESE (Practical and /OR Viva Voice)**
Legend: **MSE→ Mid Semester Examination** **ESE→ End Semester Examination**									

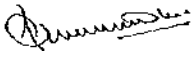
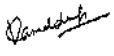
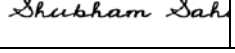
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Lecture Scheme: Mathematics [REAL ANALYSIS-I, GROUP THEORY AND DIFFERENTIAL EQUATIONS] as Generic Elective Course 3B(GE3B) i.e. GE3B						
Credits	Paper Type	Lectures per Semester		Lectures per Week		Tutorial
		Theory	Practical	Theory	Practical	
6	Theory (without Practical) (with Tutorial)	75	0	6	0	1

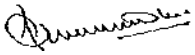
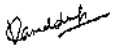
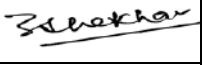
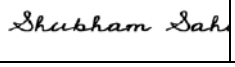
Course Objective	
The subject aims to provide the student with	
SL. No.	Objective
1.	Understand the fundamental concepts of groups, subgroups and cyclic groups.
2.	Develop an understanding of different types of differential equations.
3.	Learn various solutions methods for first-order and higher-order differential equations.
4.	Explore sequences and series including convergence criteria.

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Course Learning Outcome	
After completion of this course students will be able to:	
COs	Outcome
CO1	Demonstrate a clear understanding of groups, subgroups and their properties.
CO2	Classify and solve different types of ordinary differential equations(ODEs) and Partial differential equations(PDEs).
CO3	Demonstrate a deep understanding of limits, continuity and differentiability of real – valued functions.
CO4	Demonstrate a clear understanding of groups, subgroups and their properties.

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Instruction to Examiners / Question Setters and Marking Scheme for Mid Semester and End Semester Examination
Mid Semester Examination • No Mid Semester Examination
End Semester Examination • There will be TWO Group of Questions. • Group A is COMPULSORY and will contain THREE Questions. • Question Number 1 will be Very Short Answer Type Question consisting of TEN Sub Questions of 1 Marks each. • Question Number 2 and Question Number 3 will be Short Answer Type Questions of 5 Marks each. • Group B will contain Descriptive Type SIX Questions of 20 Marks each, out of which any FOUR Questions are to be answered. **Note:** There may be sub divisions in each question asked in Theory Examinations.

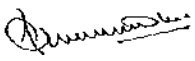
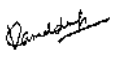
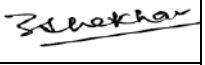
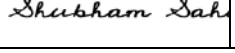
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Course Contents: Mathematics [REAL ANALYSIS-I, GROUP THEORY AND DIFFERENTIAL EQUATIONS] as Generic Elective 3B(GE3B) Theory i.e. GE3B		
Unit	**Course Contents**	**Lectures**
1.	**REAL ANALYSIS I** **Sequence: Definition, Bounds, Limit of a sequence, Monotonic Sequence and their convergence, Algebraic Operations and Limit, Cauchy Sequence, General Principle of Convergence of a sequence.** **Series: Definitions, Convergent Series, Divergent Series, Pringsheim's Theorem, Comparison tests, Cauchy's Root Test, D'Alembert's Ratio Test, Alternating Series and Leibnitz Test, Absolutely Convergent Series.**	**30**
2.	**Group Theory** **Binary Operations, Notion of Group, Abelian Group and Non-Abelian group with Examples.** **Uniqueness of Identity element and Inverse elements in a group, Different ways of Defining a Group, Concept of Subgroup and Cyclic Group, Cosets, Lagrange's Theorem.**	**25**
3.	**Differential Equations** **Differential Equations of First Order and Higher Degree, Clairaut's Form, Singular Solution,** **Orthogonal Trajectories.** **Linear Equation with Constant Co-efficient, Homogenous Linear Equation with variable coefficients.**	**20**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

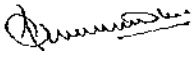
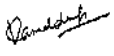
	Simultaneous equations $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$, and Total Differential Equation Pdx + Qdy + Rdz = 0 together with Geometric Significance.	

Text / Reference Books	
SL. No.	Details of Book
1.	Real Analysis: Shanti Naryan & M D Raisinghania
2.	Real Analysis: Lalji Prasad
3.	Abstract algebra: A R Vashishtha
4.	Modern Algebra: Lalji Prasad
5.	Differential Equations: MD Raisinghania

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

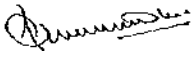
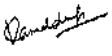
IV. Object Oriented Programming using Java as Core Course 5(CC5) i.e. CC5

Object Oriented Programming using Java as Core Course 5(CC5) i.e. CC5									
Paper Code	Paper Name	Paper Type	Total Credits	Full Marks	Pass Marks	Attendance	MSE	ESE (Theory)	ESE (Practical and /OR Viva Voce)
CC5	Object Oriented Programming Using Java	Theory (With Practical) (without Tutorial)	6	100	40	0	15	60	25
Legend: MSE→ Mid Semester Examination ESE→ End Semester Examination									

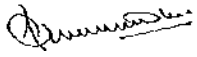
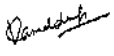
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Lecture Scheme: Object Oriented Programming using Java as Core Course 5(CC5) i.e. CC5						
Credits	Paper Type	Lectures per Semester		Lectures per Week		Tutorial
		Theory	Practical	Theory	Practical	
6	Theory (with Practical) (without Tutorial)	60	60	6	6	0

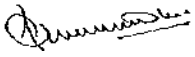
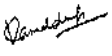
Course Objective	
The subject aims to provide the student with	
SL. No.	Objective
1.	To understand the Syntax, Semantics and Idioms of the Java Programming Language.
2.	To understand Object Oriented Programming Principles.
3.	To understand the Computation of Real Life Problems.
4.	To understand the need of User Defined Data Types.
5.	To understand the Web Scripting Concepts.

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

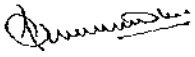
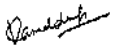
Course Learning Outcome	
After completion of this course students will be able to:	
COs	Outcome
CO1	Understand the fundamentals of Java programming language and its environment, fundamental programming structures of Java, including Data Types, Variables, Keywords, Typecasting, Arrays, and Operators. Acquire knowledge of Java's Control Statements such as if, switch, iteration statement, while, do-while, for, Nested loop, and the concepts of Objects and Classes.
CO2	Learn Inheritance and its types, including the use of the super keyword, Method overriding, Dynamic method Dispatch, and the use of Abstract Classes and Final with Inheritance
CO3	Gain a comprehensive understanding of Java's Multi-Threading concepts, String Handling, Java I/O, Wrapper Classes,
CO4	Understanding the concept of wrapper classes, frame works and connecting concept of data base
CO5	Collection Framework, Database, Event Handling, AWT, and Swing, including their classes, interfaces, and components.

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Instruction to Examiners / Question Setters and Marking Scheme for Mid Semester and End Semester Examination
Theory
Mid Semester Examination • There will be TWO Group of Questions. • Group A is COMPULSORY and will contain FIVE Questions of Very Short Answer Type Questions consisting of 1 Marks each. • Group B will contain Descriptive Type THREE Questions of Five Marks each, out of which any TWO Questions are to be answered.
End Semester Examination • There will be TWO Group of Questions. • Group A is COMPULSORY and will contain THREE Questions. • Question Number 1 will be Very Short Answer Type Questions consisting of Five Sub Questions of 1 Marks each. • Question Number 2 and Question Number 3 will be Short Answer Type Questions of 5 Marks each. • Group B will contain Descriptive Type FIVE Questions of 15 Marks each, out of which any THREE are to be answered. **Note:** There may be sub divisions in each question asked in Theory Examinations.

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Instruction to Examiners / Question Setters and Marking Scheme for Mid Semester and End Semester Examination	
Practical and Viva Voce	
Mid Semester Examination • **No Mid Semester Examination**	
End Semester Examination	
Lab: **Student have to Answer the given questions on Answer booklet and execute the answered programs/steps in computer with standard output.**	
Assignment: **The Assignment should be hand written in A4 Size Paper.** **First three pages (i.e. front page, acknowledgment, index) & Bibliography may be printout.**	
Questions: **There will be Four Questions from the Respective Core Paper in Practical Examination, out of which any TWO is to be answered.**	
Distribution of Marks	
Lab (Experiment + Answer Script)	**15**
Assignment	**5**
Viva Voce	**5**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
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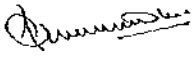
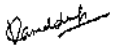
Course Contents: Object Oriented Programming using Java as Core Course 5(CC5) Theory i.e. CC5		
Unit	**Course Contents**	**Lectures**
1.	**Introduction to Java** **Object Oriented Concepts: Recapitulate concepts of Object Oriented Programming, Object, Class, Method, Abstraction, Encapsulation, Polymorphism, Inheritance, Dynamic Binding and Message Passing.** **Features of Java, Java Program Structure, Understanding the semantic and syntax differences between C++ and Java, Types of JAVA programs (Application and Applet), Java compiler, Java Interpreter, applet viewer, Javap disassemble, Javadoc Tool, Javah tool, java Keywords, Java Tokens, Java Virtual Machine (Bytecode), Compiling and Executing a Java Program, Variables, Constants, Data Types, Scope of Variables, Type Casting, Operators, Expressions, Decision Making and Branching, Looping(While, Do, For, Jumps in Loops, Labeled Loops).**	**4**
2.	**Arrays, Strings and I/O** **Creating & Using Arrays (One Dimension and Multi-dimensional), Referencing Arrays Dynamically,** **Java Strings: The Java String class, Creating & Using String Objects, Manipulating Strings, String Immutability & Equality, Passing Strings To & From Methods, String Buffer Classes. Simple I/O using**	**8**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
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	system.out and the Scanner class, Byte and Character streams, Reading/Writing from console and files.	
3.	**Object-Oriented Programming Overview** **Principles of Object-Oriented Programming, Defining & Using Classes, Controlling Access to Class Members, Class Constructors, Method Overloading, Class Variables & Methods, Objects as parameters, final classes, Object class, Garbage Collection.**	**4**
4.	**Inheritance, Interfaces, Packages, Enumerations, Autoboxing and Metadata** **Inheritance: (Single Level and Multilevel, Method Overriding, Dynamic Method Dispatch, Abstract Classes), Interfaces and Packages, Extending interfaces and packages, Package and Class Visibility,** **Using Standard Java Packages (util, lang, io, net), Wrapper Classes, Autoboxing/Unboxing, Enumerations and Metadata.**	**14**
5.	**Exception Handling, Threading, Networking and Database Connectivity** **Exception types, uncaught exceptions, throw, built-in exceptions, Creating your own exceptions;** **Multi-threading: The Thread class and Runnable interface, creating single and multiple threads, Thread prioritization, synchronization and communication, suspending/resuming threads. Using java.net package, Overview of TCP/IP and Datagram programming. Accessing and manipulating databases using JDBC.**	**15**
6.	**Applets and Event Handling**	**15**

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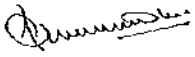
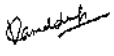
	Java Applets: Introduction to Applets, Writing Java Applets, Working with Graphics, Incorporating Images & Sounds. Event Handling Mechanisms, Listener Interfaces, Adapter and Inner Classes. The design and Implementation of GUIs using the AWT controls, Swing components of Java Foundation Classes such as labels, buttons, text fields, layout managers, menus, events and listeners; Graphic objects for drawing figures such as lines, rectangles, ovals, using different fonts. Overview of servlets.	

Text / Reference Books	
SL. No.	**Details of Book**
1.	**Black Book ,Java**
2.	**E. Balaguruswamy, "Programming with Java"**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
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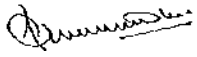
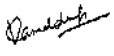
Course Contents: Object Oriented Programming using Java as Core Course 5(CC5) Practical i.e. CC5 Lab	
Program	**Course Contents**
Section I	
1.	**To find the sum of any number of integers entered as command line arguments**
2.	**To find the factorial of a given number**
3.	**To learn use of single dimensional array by defining the array dynamically.**
4.	**To learn use of length in case of a two dimensional array**
5.	**To convert a decimal to binary number**
6.	**To check if a number is prime or not, by taking the number as input from the keyboard**
7.	**To find the sum of any number of integers interactively, i.e., entering every number from the keyboard, whereas the total number of integers is given as a command line argument**
8.	**Write a program that show working of different functions of String and String Buffer classs like set Char At(, set Length(), append(), insert(), concat()and equals().**
9.	**Write a program to create a —distance‖ class with methods where distance is computed in terms of feet and inches, how to create objects of a class and to see the use of this pointer**
10.	**Modify the —distance‖ class by creating constructor for assigning values (feet and inches) to the distance object. Create another object and assign second object as reference variable to another object reference variable. Further create a third object which is a clone of the first object.**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
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11.	Write a program to show that during function overloading, if no matching argument is found, then java will apply automatic type conversions(from lower to higher data type)
12.	Write a program to show the difference between public and private access specifiers. The program should also show that primitive data types are passed by value and objects are passed by reference and to learn use of final keyword
13.	Write a program to show the use of static functions and to pass variable length arguments in a function.
14.	Write a program to demonstrate the concept of boxing and unboxing.
	Section II
1.	Write a program to show that during function overloading, if no matching argument is found, then java will apply automatic type conversions(from lower to higher data type)
2.	Write a program to show the difference between public and private access specifiers. The program should also show that primitive data types are passed by value and objects are passed by reference and to learn use of final keyword
3.	Write a program to show the use of static functions and to pass variable length arguments in a function.
4.	Write a program to demonstrate the concept of boxing and unboxing. Create a multi-file program where in one file a string message is taken as input from the user and the function to display the message on the screen is given in another file (make use of Scanner package in this program
5.	Write a program to create a multilevel package and also creates a reusable class to generate Fibonacci series, where

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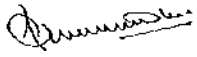
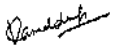
	the function to generate fibonacii series is given in a different file belonging to the same package.
6.	**Write a program that creates illustrates different levels of protection in classes/subclasses belonging to same package or different packages**
7.	**Write a program —Divide By Zero‖ that takes two numbers a and b as input, computes a/b, and invokes Arithmetic Exception to generate a message when the denominator is zero.**
8.	**Write a program to show the use of nested try statements that emphasizes the sequence of checking for catch handler statements.**
9.	**Write a program to create your own exception types to handle situation specific to your application (Hint: Define a subclass of Exception which itself is a subclass of Throwable).**
10.	**Write a program to create a multilevel package and also creates a reusable class to generate Fibonacci series, where the function to Generate Fibonacci Series is given in a different file belonging to the same package.**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
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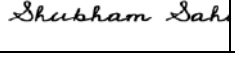
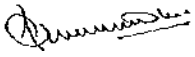
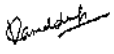
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

V. Operating System as Core Course 6(CC6) i.e. CC6

Operating System as Core Course 6(CC6) i.e. CC6									
Paper Code	**Paper Name**	**Paper Type**	**Total Credits**	**Full Marks**	**Pass Marks**	**Attendance**	**MSE**	**ESE (Theory)**	**ESE (Practical and Viva Voce)**
CC6	**Operating System**	**Theory (With Practical) (Without Tutorial)**	**6**	**100**	**40**	**0**	**15**	**60**	**25**
Legend: **MSE→ Mid Semester Examination** **ESE→ End Semester Examination**									

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
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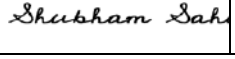
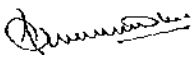
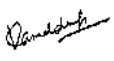
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Lecture Scheme: Operating System as Core Course 6(CC6) i.e. CC6						
Credits	Paper Type	Lectures per Semester		Lectures per Week		Tutorial
		Theory	Practical	Theory	Practical	
6	Theory (with Practical) (without Tutorial)	60	60	6	6	0

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
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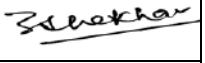
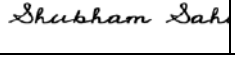
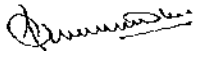
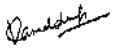
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Course Objective	
The subject aims to provide the student with	
SL. No.	Objective
1.	To educate students regarding basics of operating system.
2.	To sensitize students about organization and process scheduling.
3.	To equip students with concurrency.
4.	To train students about memory management.
5.	To inculcate the benefits of File systems and storage management.

Course Learning Outcome	
After completion of this course students will be able to:	
COs	Outcome
CO1	Understand the basic concepts of operating system.
CO2	Apply the organization and process scheduling.
CO3	Analyse the process synchronization.
CO4	An understanding of memory management.
CO5	Develop understanding of File systems and storage management

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
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Marking Scheme for Mid Semester and End Semester Examination
Theory
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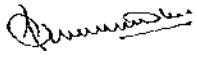
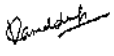
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
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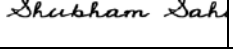
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Instruction to Examiners / Question Setters and Marking Scheme for Mid Semester and End Semester Examination	
Practical and Viva Voce	
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Assignment: **The Assignment should be hand written in A4 Size Paper.** **First three pages (i.e. front page, acknowledgment, index) & Bibliography may be printout.**	
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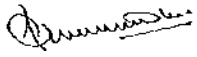
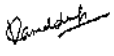
Distribution of Marks	
Lab (Experiment + Answer Script)	**15**
Assignment	**5**
Viva Voce	**5**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
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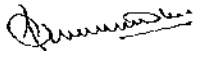
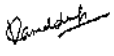
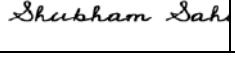
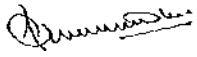
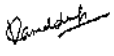
Course Contents: Operating System as Core Course 6(CC6) Theory i.e. CC6		
Unit	**Course Contents**	**Lectures**
1.	**Introduction** **Basic OS functions, resource abstraction, types of operating systems–multiprogramming systems, batch systems, time sharing systems; operating systems for personal computers & workstations, process control & real time systems.**	**10**
2.	**Operating System Organization** **Processor and user modes, kernels, system calls and system programs.**	**6**
3.	**Process Management** **System view of the process and resources, process abstraction, process hierarchy, threads, threading issues, thread libraries; Process Scheduling, non-pre-emptive and pre-emptive scheduling algorithms; concurrent and processes, critical section, semaphores, methods for inter-process communication; deadlocks.**	**20**
4.	**Memory Management** **Physical and virtual address space; memory allocation strategies -fixed and variable partitions, paging, segmentation, virtual memory**	**10**
5.	**File and I/O Management**	**10**

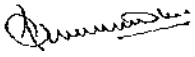
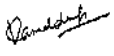
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

	Directory structure, file operations, file allocation methods, device management.	
6.	**Protection and Security** **Policy mechanism, Authentication, Internal access Authorization.**	**4**

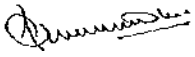
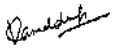
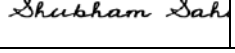
Text / Reference Books	
SL. No.	**Details of Book**
1.	**A Silberschatz, P.B. Galvin, G. Gagne, Operating Systems Concepts, 8th Edition, John Wiley Publications 2008.**
2.	**A.S. Tanenbaum, Modern Operating Systems, 3rd Edition, Pearson Education 2007.**
3.	**Gagne Galvin, Operating Systems: 10th Edition.**
4.	**W. Stallings, Operating Systems, Internals & Design Principles, 5th Edition, Prentice Hall of India. 2008.**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Syllabus: – Operating System as Core Course 6(CC6) Practical i.e. CC6 Lab	
Program	**Course Contents**
1.	**Write a program (using fork() and/or exec() commands) where parent and child execute:** **a. same program, same code.** **b. same program, different code.** **c. before terminating, the parent waits for the child to finish its task.**
2.	**Write a program to report behaviour of Linux Kernel including kernel version, CPU type and model. (CPU information)**
3.	**Write a program to report behaviour of Linux kernel including information on configured memory, amount of free and used memory. (memory information)**
4.	**Write a program to print file details including owner access permissions, file access time, where file name given as argument.**
5.	**Write a program to copy files using system calls.**
6.	**Write program to implement FCFS scheduling algorithm.**
7.	**Write program to implement Round Robin scheduling algorithm.**
8.	**Write program to implement SJF scheduling algorithm.**

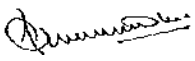
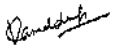
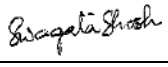
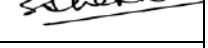
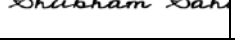
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

9.	**Write program to implement non-preemptive priority based scheduling algorithm.**
10.	**Write program to implement preemptive priority based scheduling algorithm.**
11.	**Write program to implement SRJF scheduling algorithm.**
12.	**Write program to calculate sum of n numbers using thread library.**
13.	**Write a program to implement first-fit, best-fit and worst-fit allocation strategies.**

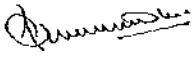
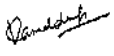
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

VI. Data Communication and Computer Network as Core Course 7(CC7) i.e. CC7

Data Communication and Computer Network as Core Course 7(CC7) i.e. CC7									
Paper Code	**Paper Name**	**Paper Type**	**Total Credits**	**Full Marks**	**Pass Marks**	**Attendance**	**MSE**	**ESE (Theory)**	**ESE (Practical and Viva Voce)**
CC7	**Data Communication and Computer Network**	**Theory (With Practical) (Without Tutorial)**	**6**	**100**	**40**	**0**	**15**	**60**	**25**
Legend: **MSE→ Mid Semester Examination** **ESE→ End Semester Examination**									

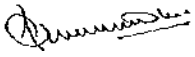
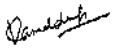
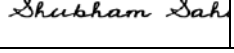
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Lecture Scheme: Data Communication and Computer Network as Core Course 7(CC7) i.e. CC7						
Credits	Paper Type	Lectures per Semester		Lectures per Week		Tutorial
		Theory	Practical	Theory	Practical	
6	Theory (with Practical) (without Tutorial)	60	60	6	6	0

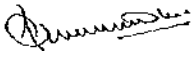
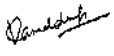
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Course Objective	
The subject aims to provide the student with	
SL. No.	Objective
1.	An understanding of basic concepts of Computer Networks.
2.	An introduction to Data Link Layer.
3.	An understanding of Network Layer.
4.	An introduction to Transport Layer.
5.	An introduction to Presentation and Application Layer.

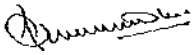
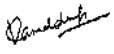
Course Learning Outcome	
After completion of this course students will be able to:	
COs	Outcome
CO1	Explain the needs of Computer Networks.
CO2	Explain the working and need of Data Link Layer.
CO3	Demonstrate the use of and working of Network Layer.
CO4	Explain the working of Transport Layer.
CO5	Explain the need and working of Presentation and Application Layer.

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

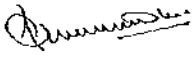
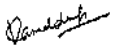
Instruction to Examiners / Question Setters and Marking Scheme for Mid Semester and End Semester Examination
Theory
Mid Semester Examination • There will be TWO Group of Questions. • Group A is COMPULSORY and will contain FIVE Questions of Very Short Answer Type Questions consisting of 1 Marks each. • Group B will contain Descriptive Type THREE Questions of Five Marks each, out of which any TWO Questions are to be answered.
End Semester Examination • There will be TWO Group of Questions. • Group A is COMPULSORY and will contain THREE Questions. • Question Number 1 will be Very Short Answer Type Questions consisting of Five Sub Questions of 1 Marks each. • Question Number 2 and Question Number 3 will be Short Answer Type Questions of 5 Marks each. • Group B will contain Descriptive Type FIVE Questions of 15 Marks each, out of which any THREE are to be answered. **Note:** There may be sub divisions in each question asked in Theory Examinations.

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Instruction to Examiners / Question Setters and Marking Scheme for Mid Semester and End Semester Examination	
Practical and Viva Voce	
Mid Semester Examination • **No Mid Semester Examination**	
End Semester Examination	
Lab: **Student have to Answer the given questions on Answer booklet and execute the answered programs/steps in computer with standard output.**	
Assignment: **The Assignment should be hand written in A4 Size Paper.** **First three pages (i.e. front page, acknowledgment, index) & Bibliography may be printout.**	
Questions: **There will be TWO Questions from the Respective Core Paper in Practical Examination, out of which any ONE is to be answered.**	
Distribution of Marks	
Lab (Experiment + Answer Script)	**15**
Assignment	**5**
Viva Voce	**5**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Course Contents: Data Communication and Computer Network as Core Course 7(CC7) Theory i.e. CC7		
Unit	**Course Contents**	**Lectures**
1.	**Introduction to Computer Networks** Network definition; Types of transmission, network topologies; network classifications; network protocol; layered network architecture.	8
2.	**Data Communication Fundamentals and Techniques** Analog and digital signal; data-rate limits; digital to digital line encoding schemes; pulse code modulation; parallel and serial transmission; digital to analog modulation-; multiplexing techniques-FDM, TDM; transmission media, Transmission impairments., overview of OSI reference model; overview of TCP/IP protocol suite.	10
3.	**Networks Switching Techniques and Access Mechanisms** Circuit Switching; Connectionless and Connection oriented communication, Circuit Switching, Crossbar and multistage switching packets switching, Datagram and virtual circuits	10
4.	**Data Link Layer Functions and Protocol** Error detection and error correction techniques; data-link control- framing and flow control; error recovery protocols- stop and wait ARQ, go-back-n ARQ; Point to Point Protocol on Internet.	10

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
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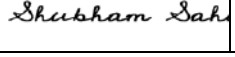
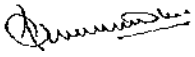
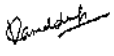
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

5.	**Multiple Access Protocol and Networks** CSMA/CD protocols; Ethernet LANS; connecting LAN and back-bone networks- repeaters, hubs, switches, bridges, router and gateways.	5
6.	**Networks Layer Functions and Protocols** Routing; routing algorithms; network layer protocol of Internet-IP protocol, Concepts of IP address, IPV4 address structure, Classes of IP address, sub-netting,	6
7.	**Transport Layer Functions and Protocols** Transport services- error and flow control, Parity, checksum and CRC based error handling, Connection establishment and release- three way handshake.	6
8.	**Overview of Application Layer Protocol** Overview of DNS protocol; overview of WWW & HTTP protocol.	5

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
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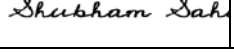
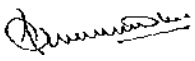
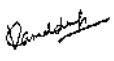
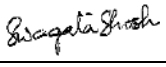
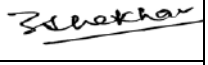
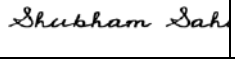
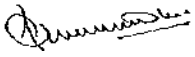
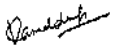
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

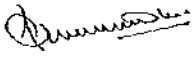
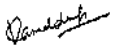
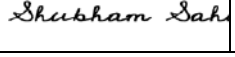
Text / Reference Books	
SL. No.	**Details of Book**
1.	**B. A. Forouzan: Data Communications and Networking, Fourth edition, THM, 2007.**
2.	**S. Tanenbaum: Computer Networks, Fourth edition, PHI, 2002**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Course Contents: Data Communication and Computer Networks as Core Course 7(CC7) Practical i.e. CC7 Lab	
Program	**Course Contents**
	Section I
1.	**Explain the following networking protocols with their syntax.** **a. Ping** **b. Ipstat** **c. http** **d. ftp** **e. ip** **f. config** **g. netstat** **h. lpr**
2.	**Configure TCP**
3.	**Configure Router**
4.	**Configure Remote Machine**
5.	**Internetworking devices:- NIC, Modems, Repeaters, Routers, Hubs, Bridges, Switches and Gateways**
	Section II
1.	**Simulate Cyclic Redundancy Check (CRC) error detection algorithm for noisy channel.**
2.	**Simulate and implement stop and wait protocol for noisy channel.**
3.	**Simulate and implement go back n sliding window protocol.**

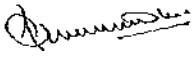
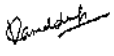
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

4.	**Simulate and implement selective repeat sliding window protocol.**
5.	**Simulate and implement distance vector routing algorithm**
6.	**Simulate and implement Dijkstra algorithm for shortest path routing.**

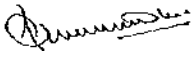
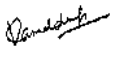
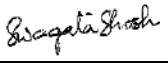
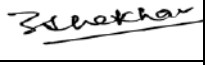
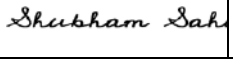
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

VII. Core Course Practical 3(CP3): CC5 Lab, CC6 Lab and CC7 Lab

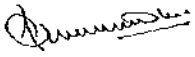
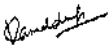
Core Course Practical 3(CP3): CC5 Lab, CC6 Lab and CC7 Lab									
Paper Code	Paper Name	Paper Type	Total Credits	Full Marks	Pass Marks	MSE	Assignment	ESE (Lab (Experiment + Answer script))	Viva Voce
CC5 Lab	Data Structure with C Lab	Practical	2	25		0	5	15	5
CC6 Lab	Operating System Lab	Practical	2	25		0	5	15	5
CC7 Lab	Computer Networks Lab	Practical	2	25			5	15	5
CP3		Practical	6	75	30	0	15	45	15
Legend: MSE→ Mid Semester Examination ESE→ End Semester Examination									

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

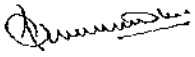
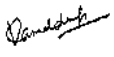
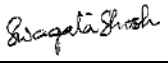
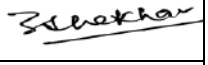
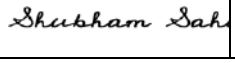
Lecture Scheme: Core Course Practical 3(CP3): CC5 Lab, CC6 Lab and CC7 Lab						
Credits	Paper Type	Lectures per Semester		Lectures per Week		Tutorial
		Theory	Practical	Theory	Practical	
6	Practical (with Theory) (without Tutorial)	60 + 60 + 60	60 + 60 + 60	6 + 6 + 6	6 + 6 + 6	0 + 0 + 0

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

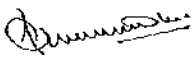
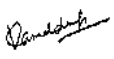
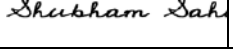
Core Course Practical 3(CP3): CC5 Lab, CC6 Lab and CC7 Lab Instruction to Examiners / Question Setters and Marking Scheme for Mid Semester and End Semester Examination	
Mid Semester Examination • **No Mid Semester Examination**	
End Semester Examination • **There will be THREE GROUPS of Questions in Practical Examination of 3 Hours.** • **Group A: Questions from Core Paper 5(CC5) will contain FOUR Questions, out of which any TWO Questions are to be answered.** • **Group B: Questions from Core Paper 6(CC6) will contain TWO Questions, out of which any ONE Question is to be answered.** • **Group C: Questions from Core Paper 7(CC7) will contain TWO Questions, out of which any ONE Question is to be answered.**	
Lab: **Student have to Answer the given questions on Answer booklet and execute the answered programs/steps in computer with standard output.**	
Assignment: **The Assignment should be hand written in A4 size paper. First three pages (i.e. front page + acknowledgment + index) & Bibliography may be printout.**	
Marks Distribution:	
Lab (Experiment + Answer Script)	**45 Marks (15 Marks + 15 Marks + 15 Marks)**
Assignment	**15 Marks (5 marks + 5 Marks + 5 Marks)**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Viva Voce	**15 Marks (5 marks + 5 Marks + 5 Marks)**

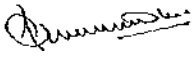
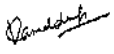
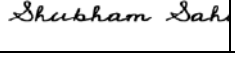
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Fourth Semester

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

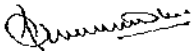
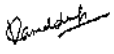
I. Matlab Programming as Skill Enhancement Course 2(SEC2) Theory i.e. SEC2

Matlab Programming as Skill Enhancement Course 2(SEC2) Theory i.e. SEC2									
Paper Code	**Paper Name**	**Paper Type**	**Total Credits**	**Full Marks**	**Pass Marks**	**Attendance**	**MSE**	**ESE (Theory)**	**ESE (Practical and /OR Viva Voice)**
SEC2	**Matlab**	**Theory (With Practical)**	**2**	**100**	**40**	**0**	**0**	**75**	**25**
Legend: **MSE→ Mid Semester Examination** **ESE→ End Semester Examination**									

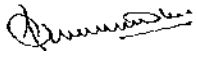
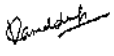
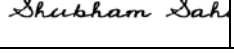
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Lecture Scheme: Matlab Programming as Skill Enhancement Course 2(SEC2) i.e. SEC2							
Credits	Paper Type	Lectures per Semester		Lectures per Week		Assignment	Tutorial
		Theory	Practical	Theory	Practical		
2	Theory (with Practical) (without Tutorials)	15	30	1	4	0	0

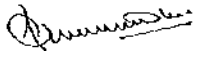
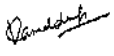
Course Objective	
The subject aims to provide the student with	
SL. No.	Objective
1.	To equip students with fundamental programming skills and knowledge of the MATLAB environment.
2.	To enable students to solve engineering and scientific problems using algorithms and the software's capabilities.
3.	To provide students with an in-depth hands-on demonstration and practical sessions, within a stimulating environment.
4.	To introduce students to MATLAB as a tool for designing and evaluating digital filters, prior to implementing them in Hardware.
5.	To provide an opportunity to students to develop inter disciplinary skills.

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

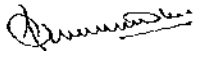
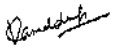
Course Learning Outcome	
After completion of this course students will be able to:	
COs	Outcome
CO1	Use MATLAB effectively to analyze and visualize data.
CO2	Apply numeric techniques and computer simulations to solve engineering-related problems.
CO3	Apply a top-down, modular, and systematic approach to design, write, test, and debug sequential MATLAB programs to achieve computational objectives.
CO4	Design and document computer programs and analyses in a careful and complete manner so as to effectively communicate results, to facilitate evaluation and debugging by another programmer, and to anticipate and resolve user errors.
CO5	Demonstrate understanding and use of fundamental data structures (classes).
CO6	Create and control simple plot and user-interface graphics objects in MATLAB.

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

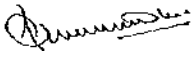
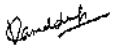
Instruction to Examiners / Question Setters and Marking Scheme for Mid Semester and End Semester Examination
Theory
Mid Semester Examination • No Mid Semester Examination
End Semester Examination • There will be TWO Group of Questions. • Group A is COMPULSORY and will contain THREE Questions. • Question Number 1 will be Very Short Answer Type Questions consisting of Five Sub Questions of 1 Marks each. • Question Number 2 and Question Number 3 will be Short Answer Type Questions of 5 Marks each. • Group B will contain Descriptive Type SIX Questions of 15 Marks each, out of which any FOUR are to be answered. **Note:** **There may be sub divisions in each question asked in Theory Examinations.**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

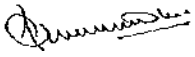
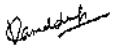
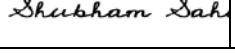
Instruction to Examiners / Question Setters and Marking Scheme for Mid Semester and End Semester Examination	
Practical and Viva Voce	
Mid Semester Examination • **No Mid Semester Examination**	
End Semester Examination	
Lab: **Student have to Answer the given questions on Answer booklet and execute the answered programs/steps in computer with standard output.**	
Assignment: **The Assignment should be hand written in A4 Size Paper.** **First three pages (i.e. front page, acknowledgment, index) & Bibliography may be printout.**	
Questions: **There will be FOUR Questions from the Respective Core Paper in Practical Examination, out of which any TWO is to be answered.**	
Distribution of Marks	
Lab (Experiment + Answer Script)	**15**
Assignment	**5**
Viva Voce	**5**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

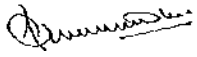
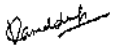
Course Contents: Matlab Programming as Skill Enhancement Course2(SEC2) Theory i.e. SEC2		
Unit	**Course Contents**	**Lectures**
1.	**Introduction to Programming:** **Components of a computer, working with numbers, Machine Code, Software Hierarchy.**	**2**
2.	**Programming Environment:** **MATLAB Windows, A First Program, Expressions, Constants, Variables and assignment statement, Arrays.**	**2**
3.	**Graph Plots:** **Basic plotting, Built in functions, Generating waveforms, Sound replay, load and save.**	**3**
4.	**Procedures and Functions: Arguments and return values, M-files, Formatted console input – output, String handling.**	**2**
5.	**Control Statements:** **Conditional Statements:** **If, Else, Else - If,** **Repetition statements:** **While, For Loop.**	**2**
6.	**Manipulating Text: Writing to a text file, Reading from a text file, Randomising and sorting a list, searching a list.**	**2**
7.	**Manipulating Text:** **Writing to a text file, Reading from a text file, Randomising and sorting a list, searching a list.**	**2**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

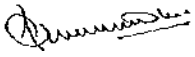
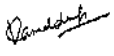
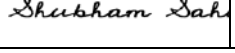
Text / Reference Books	
SL. No.	**Details of Book**
1.	**MATLAB: An Introduction with Applications, by Amos Gilat, 2nd edition, Wiley, 2004,**
2.	**C.B. Moler, Numerical Computing with MATLAB, SIAM, 2004.**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Course Contents: Matlab Programming as Skill Enhancement Course2(SEC2) Practical i.e. SEC2 Lab	
Unit	**Course Contents**
1.	**Calculate 10 approximate points from the function y=2x by using the formulae:** **a. $x_n = n$** **b. $y_n = 2n + rand - 0.5$**
2.	**Fit a line of best fit to these points using the function polyfit() with degree=1, and generate coordinates from the line of best fit using polyval(). Use the on-line help to find out how to use these functions. Plot the raw data and the line of best fit.**
3.	**Calculate and replay 1 second of a sinewave at 500Hz with a sampling rate of 11025Hz. Save the sound to a file called "ex35.wav". Plot the first 100 samples**
4.	**Calculate and replay a 2 second chirp. That is, a sinusoid that steadily increases in frequency with time, from say 250Hz at the start to 1000Hz at the end.**
5.	**5. 4 Build a square wave by adding together 10 odd harmonics: 1f, 3f, 5f, etc. The amplitude of the nth harmonic should be 1/n. Display a graph of one cycle of the result superimposed on the individual harmonics.**
6.	**Write a function called FtoC (ftoc.m) to convert Fahrenheit temperatures into Celsius. Make sure the program has a title comment and a help page. Test from the command window with:** **a. FtoC(96)** **b. Look for Fahrenheit**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

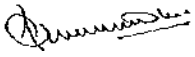
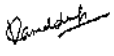
	c. help F to C
7.	Write a program to input 2 strings from the user and to print out a. the concatenation of the two strings with a space between them, b. a line of asterisks the same length as the concatenated strings, and c. the reversed concatenation. For example: a. Enter string 1: Mark b. Enter string 2: Huckvale c. Mark Huckvale d. ********** e. elavkcuH kraM

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

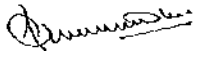
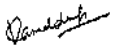
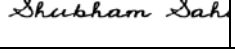
II. Statistics [Applied Statistics] as Generic Elective 4A(GE4A) i.e. GE4A

Statistics [Applied Statistics] as Generic Elective Course 4A(GE4A) i.e. GE4A									
Paper Code	**Paper Name**	**Paper Type**	**Total Credits**	**Full Marks**	**Pass Marks**	**Attendance**	**MSE**	**ESE (Theory)**	**ESE (Practical and /OR Viva Voice)**
GE4A	**Statistics**	**Theory (Without Practical) (with Tutorial)**	**6**	**100**	**40**	**0**	**0**	**100**	**No ESE (Practical and /OR Viva Voice)**
Legend: **MSE→ Mid Semester Examination** **ESE→ End Semester Examination**									

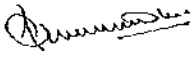
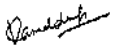
Lecture Scheme: Statistics [Applied Statistics] as Generic Elective Course 4A(GE4A) i.e. GE4A						
Credits	**Paper Type**	**Lectures per Semester**		**Lectures per Week**		**Tutorial**
		Theory	**Practical**	**Theory**	**Practical**	
6	**Theory (Without Practical) (with Tutorial)**	**75**	**0**	**6**	**0**	**1**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Instruction to Examiners / Question Setters and Marking Scheme for Mid Semester and End Semester Examination
Mid Semester Examination • No Mid Semester Examination
End Semester Examination • There will be TWO Group of Questions. • Group A is COMPULSORY and will contain THREE Questions. • Question Number 1 will be Very Short Answer Type Question consisting of TEN Sub Questions of 1 Marks each. • Question Number 2 and Question Number 3 will be Short Answer Type Questions of 5 Marks each. • Group B will contain Descriptive Type SIX Questions of 20 Marks each, out of which any FOUR Questions are to be answered. **Note:** There may be sub divisions in each question asked in Theory Examinations.

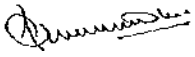
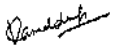
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Course Contents: Statistics [Applied Statistics] as Generic Elective Course 4A(GE4A) i.e. GE4A		
Unit	**Course Contents**	**Lectures**
1.	**Economic Time Series:** Components of time series, Decomposition of time series- Additive and multiplicative model with their merits and demerits, Illustrations of time series. Measurement of trend by method of free-hand curve, method of semi-averages and method of least squares (linear, quadratic and exponential curves). Measurement of seasonal variations by method of simple averages.	25
2.	**Statistical Quality Control:** Importance of statistical methods in industrial research and practice. Determination of tolerance limits. Causes of variations in quality: chance and assignable. General theory of control charts, process & product control, Control charts for variables: X- bar and R-charts. Control charts for attributes: p and c-charts.	20
3.	**Demographic Methods:** Introduction, measurement of population, rates and ratios of vital events. Measurement of mortality: CDR, SDR (w.r.t. Age and sex), IMR, Standardized death rates. Life (mortality) tables: definition of its main functions and uses. Measurement of fertility and reproduction: CBR,	30

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

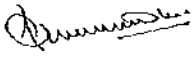
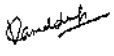
	GFR, and TFR. Measurement of population growth: GRR, NRR.	

Test / Reference Books	
SL. No.	**Details of Book**
1.	**Mukhopadhyay, P. (1999): Applied Statistics, New Central Book Agency, Calcutta.**
2.	**Gun, A.M., Gupta, M.K. and Dasgupta, B. (2008): Fundamentals of Statistics, Vol. II, 9th Edition World Press, Kolkata.**
3.	**Gupta, S. C. and Kapoor, V.K. (2008): Fundamentals of mathematical Statistics, 4th Edition(Reprint), Sultan Chand & Sons**
4.	**Montgomery, D. C. (2009): Introduction to Statistical Quality Control, 6th Edition, Wiley India Pvt. Ltd.**
5.	**Fundamentals of Applied Statistics , S. C. Gupta & V.K. Kapoor**

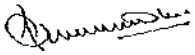
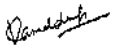
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

III. Mathematics [REAL ANAYSIS-II, COMPLEX VARIABLE, SET THEORY AND MATRICES] as Generic Elective 4B(GE4B) i.e. GE4B

Mathematics [REAL ANAYSIS-II, COMPLEX VARIABLE, SET THEORY AND MATRICES] as Generic Elective Course 4B(GE4B) i.e. GE4B									
Paper Code	**Paper Name**	**Paper Type**	**Total Credits**	**Full Marks**	**Pass Marks**	**Attendance**	**MSE**	**ESE (Theory)**	**ESE (Practical and /OR Viva Voice)**
GE4B	**Mathematics**	**Theory (Without Practical) (with Tutorial)**	**6**	**100**	**40**	**0**	**0**	**100**	**No ESE (Practical and /OR Viva Voice)**
Legend: **MSE→ Mid Semester Examination** **ESE→ End Semester Examination**									

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Lecture Scheme: Mathematics [REAL ANAYSIS-II, COMPLEX VARIABLE, SET THEORY AND MATRICES] as Generic Elective Course 4B(GE4B) i.e. GE4B						
Credits	Paper Type	Lectures per Semester		Lectures per Week		Tutorial
		Theory	Practical	Theory	Practical	
6	Theory (Without Practical) (with Tutorial)	75	0	6	0	1

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
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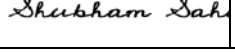
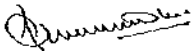
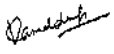
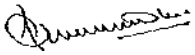
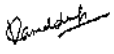
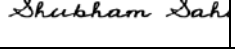
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Instruction to Examiners / Question Setters and Marking Scheme for Mid Semester and End Semester Examination
Mid Semester Examination • No Mid Semester Examination
End Semester Examination • There will be TWO Group of Questions. • Group A is COMPULSORY and will contain THREE Questions. • Question Number 1 will be Very Short Answer Type Question consisting of TEN Sub Questions of 1 Marks each. • Question Number 2 and Question Number 3 will be Short Answer Type Questions of 5 Marks each. • Group B will contain Descriptive Type SIX Questions of 20 Marks each, out of which any FOUR Questions are to be answered. **Note:** There may be sub divisions in each question asked in Theory Examinations.

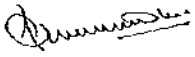
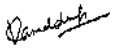
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Course Contents: Mathematics [REAL ANAYSIS-II, COMPLEX VARIABLE, SET THEORY AND MATRICES] as Generic Elective Course 4B(GE4B) i.e. GE4B		
Unit	**Course Contents**	**Lectures**
1.	**REAL ANALYSIS II** **Riemann Integration, definition, Oscillatory sum and inerrability condition. Integrality of Monotonic and continuous functions. Fundamental theorem of integral calculus.**	**20**
2.	**COMPLEX VARIABLE** **Real Functions of Two Variables: Simultaneous and Iterated limits: Continuity, Partial Derivatives, Differentiability and related Necessary and Sufficient conditions. Functions of Complex variables Limit, Continuity, Derivative, Cauchy – Riemann Equations, Analytic Function, Harmonic function.**	**25**
3.	**Set Theory** **Indexed Family of Sets, Generalized Set of Operations & DeMorgan's Laws, Set mapping, Countable and Uncountable Sets, Partition of a Set, Equivalence relation and related necessary and sufficient condition.** **Fundamental Theorem of Partition. Partial Order Relation and related concepts of u.b., l.b., Inf., Sup, Maximal Element, Minimal Element and Lattice (Definition and Examples only).**	**18**
4.	**Matrices**	**12**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

	Definitions, Operations on Matrices, Matrix Algebra, Type of Matrices, Transpose, Adjoint and Inverse of a matrix, Solution of system of linear equations.	

Text / Reference Books	
SL. No.	**Details of Book**
1.	**Real Analysis, Shanti Narayan & M D Raisinghania**
2.	**Real Analysis: Lalji Prasad.**
3.	**Complex Variables: J N Sharma.**
4.	**Set Theory: K K Jha**
5.	**Matrices: A. R. Vasishtha**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
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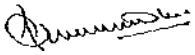
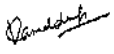
IV. Theory of Computation as Core Course 8(CC8) i.e. CC8

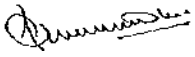
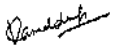
Theory of Computation as Core Course 8(CC8) i.e. CC8									
Paper Code	Paper Name	Paper Type	Total Credits	Full Marks	Pass Marks	Attendance	MSE	ESE (Theory)	ESE (Practical and Viva Voce)
CC8	Theory of Computation	Theory (Without Practical) (With Tutorial)	6	100	40	0	25	75	No ESE (Practical and Viva Voce)
Legend: MSE→ Mid Semester Examination ESE→ End Semester Examination									

Lecture Scheme: Theory of Computation as Core Course 8(CC8) i.e. CC8						
Credits	Paper Type	Lectures per Semester		Lectures per Week		Tutorial
		Theory	Practical	Theory	Practical	
6	Theory (without Practical) (with Tutorials)	75	0	6	0	1

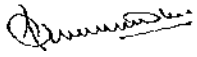
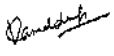
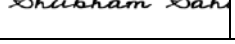
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Course Objective	
The subject aims to provide the student with	
SL. No.	Objective
1.	To give an overview of the theoretical foundations of computer science from the perspective of formal languages.
2.	To illustrate finite state machines to solve problems in computing.
3.	To explain the hierarchy of problems arising in the computer sciences.
4.	To familiarize Regular grammars, context frees grammar.
5.	To give an overview of the theoretical foundations of computer science from the perspective of formal languages.

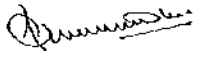
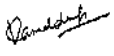
Course Learning Outcome	
After completion of this course students will be able to:	
COs	Outcome
CO1	To use basic concepts of formal languages of finite automata techniques.
CO2	Construct automata theory using Finite Automata.
CO3	Construct context free grammar for various languages.
CO4	Design context free grammar and Pushdown Automata.
CO5	Explain Turing machine for computational functions.

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

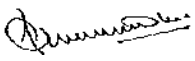
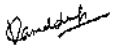
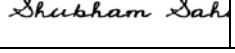
Instruction to Examiners / Question Setters and Marking Scheme for Mid Semester and End Semester Examination
Mid Semester Examination • There will be TWO Group of Questions. • Group A is COMPULSORY and will contain FIVE Questions of Very Short Answer Type Questions consisting of 2 Marks each. • Group B will contain Descriptive Type FOUR Questions of Five Marks each, out of which any THREE Questions are to be answered.
End Semester Examination • There will be TWO Group of Questions. • Group A is COMPULSORY and will contain THREE Questions. • Question Number 1 will be Very Short Answer Type Question consisting of FIVE Sub Questions of 1 Marks each. • Question Number 2 and Question Number 3 will be Short Answer Type Questions of 5 Marks each. • Group B will contain Descriptive Type SIX Questions of 15 Marks each, out of which any FOUR Questions are to be answered. **Note:** There may be sub divisions in each question asked in Theory Examinations.

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Course Contents: – Theory of Computation as Core Course 8(CC8) Theory i.e. CC8		
Unit	**Course Contents**	**Lectures**
1.	**Languages:** **Alphabets, string, language, Basic Operations on language, Concatenation, Kleene Star.**	**10**
2.	**Finite Automata and Regular Languages:** **Regular Expressions, Transition Graphs, Deterministic and Non – Deterministic finite automata, NFA to DFA Conversion, Regular languages and their relationship with finite automata, Pumping lemma and closure properties of regular languages.**	**20**
3.	**Context Free Languages:** **Context free grammars, parse trees, ambiguities in grammars and languages, Pushdown automata (Deterministic and Non-deterministic), Pumping Lemma, Properties of context free languages, normal forms.**	**20**
4.	**Turing Machines and Models of Computations:** **RAM, Turing Machine as a model of computation, Universal Turing Machine, Language acceptability, decidability, halting problem, Recursively enumerable and recursive languages, unsolvability problems.**	**25**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Text / Reference Books	
SL. No.	**Details of Book**
1.	Daniel I. A. Cohen, Introduction to computer theory, John Wiley,1996
2.	Lewis & Papadimitriou, Elements of the theory of computation, PHI 1997.
3.	Hoperoft, Aho, Ullman, Introduction to Automata theory, Language & Computation –3rd Edition, Pearson Education. 2006
4.	Theory of Automata by K.L.P Mishra and N Chandrashekharan

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

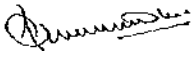
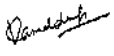
V. Visual Basic.Net as Core Course 9(CC9) i.e. CC9

Visual basic.Net as Core Course 9(CC9) i.e. CC9									
Paper Code	Paper Name	Paper Type	Total Credits	Full Marks	Pass Marks	Attendance	MSE	ESE (Theory)	ESE (Practical and Viva Voce)
CC9	Visual Basic.Net	Theory (With Practical) (Without Tutorial)	6	100	40	0	15	60	25
Legend: MSE→ Mid Semester Examination ESE→ End Semester Examination									

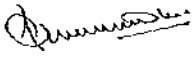
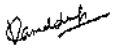
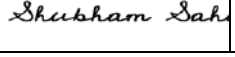
Lecture Scheme: Visual Basic.Net as Core Course 9(CC9) i.e. CC9						
Credits	Paper Type	Lectures per Semester		Lectures per Week		Tutorial
		Theory	Practical	Theory	Practical	
6	Theory (with Practical) (without Tutorial)	60	60	6	6	0

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

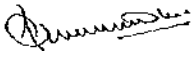
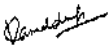
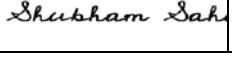
Course Objective	
The subject aims to provide the student with	
SL. No.	Objective
1.	To equip students with the skills to build applications using VB.NET.
2.	Focusing on programming fundamentals, object oriented principles, and practical application development.
3.	The student will use Visual Basic.Net to build Windows applications using structured and object based programming techniques.
4.	Design and develop programs with GUI interfaces
5.	Code programs and develop interface using Visual Basic .Net

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

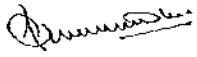
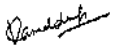
Course Learning Outcome	
After completion of this course students will be able to:	
COs	Outcome
CO1	Design, formulate, and construct applications with Visual Basic.NET
CO2	Translate general requirements into data related solutions using database concepts.
CO3	Build integrated Visual Basic.NET solutions using files and structures with printing capabilities
CO4	Separate operations into appropriate Visual Basic.NET procedures and functions
CO5	Assemble multiple forms, modules, and menus into working Visual Basic.NET solutions

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

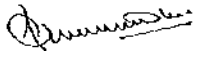
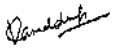
Instruction to Examiners / Question Setters and Marking Scheme for Mid Semester and End Semester Examination
Theory
Mid Semester Examination • There will be TWO Group of Questions. • Group A is COMPULSORY and will contain FIVE Questions of Very Short Answer Type Questions consisting of 1 Marks each. • Group B will contain Descriptive Type THREE Questions of Five Marks each, out of which any TWO Questions are to be answered.
End Semester Examination • There will be TWO Group of Questions. • Group A is COMPULSORY and will contain THREE Questions. • Question Number 1 will be Very Short Answer Type Questions consisting of Five Sub Questions of 1 Marks each. • Question Number 2 and Question Number 3 will be Short Answer Type Questions of 5 Marks each. • Group B will contain Descriptive Type FIVE Questions of 15 Marks each, out of which any THREE are to be answered. **Note:** There may be sub divisions in each question asked in Theory Examinations.

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Instruction to Examiners / Question Setters and Marking Scheme for Mid Semester and End Semester Examination	
Practical and Viva Voce	
Mid Semester Examination • **No Mid Semester Examination**	
End Semester Examination	
Lab: **Student have to Answer the given questions on Answer booklet and execute the answered programs/steps in computer with standard output.**	
Assignment: **The Assignment should be hand written in A4 Size Paper.** **First three pages (i.e. front page, acknowledgment, index) & Bibliography may be printout.**	
Questions: **There will be FOUR Questions from the Respective Core Paper in Practical Examination, out of which any TWO is to be answered.**	
Distribution of Marks	
Lab (Experiment + Answer Script)	**15**
Assignment	**5**
Viva Voce	**5**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Course Contents: Visual Basic.Net as Core Course 9(CC9) Theory i.e. CC9		
Unit	**Course Contents**	**Lectures**
1.	Introduction to VB.NET Event Driven Programming, NET as better Programming Platform, NET Framework, NET Architecture, The Just-In-Time Compiler, NET Framework class library introduction.	10
2.	Elements of User Interface Windows Forms, Text Boxes, Buttons, Labels, Check Boxes, and Radio Buttons, List Boxes, Combo Boxes. Picture Boxes, Scrollbars, Splitters, Timer, Menus, Built-in Dialogs, Image List, Tree Views, List Views, Toolbars, Status Bar and Progress bars.	10
3.	Mastering VB Language Data, Operators, Conditionals and Loops, Procedures, Error Handling, Classes and Objects.	12
4.	Elements Object Oriented Programming in VB .NET Class and Object, Properties, methods and events, Constructors and Destructors, Method overloading, Inheritance, Access modifiers: Public, Private, Protected, Friend, Overloading and Overriding, Interfaces, Polymorphism	12
5.	Exception Handling Introduction to Exception Handling. Handling Different Types of Exceptions.	8
6.	Name Spaces	2

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
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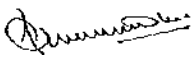
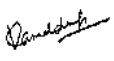
	Common Name Spaces.	
7.	**Databases in VB .NET** **Database: Connections, Connection to database with server explorer Multiple Table Connection with Data grid.**	**6**

Text / Reference Books	
SL. No.	**Details of Book**
1.	**Programming Microsoft Visual Basic.NET – Francesco Balena**
2.	**The Complete Reference -Visual Basic .NET – Jefrey R. Shapiro**
3.	**VB.NET database programming with ADO.NET -Anne Prince and Doug Lowe.**
4.	**The Visual Basic.NET COACH Visual Basic .NET 2003 in 21 Days. – Steven Holzner, SAMS Publications. Mastering Crystal Report - BPB Publication**
5.	**Crystal Report – The Complete Reference :- Tata McGraw Hill**
6.	**VB. Net-Halls, Macarthy, L.Hotka**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
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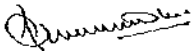
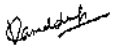
Course Contents: Visual Basic.Net as Core Course 9 (CC9) Practical i.e. CC9 Lab	
Program	**Course Contents**
1.	Console Based Programming
2.	Window Based Programming
3.	Application Development using Database connectivity
4.	Accept ten (10) names in a variable and find out the one which is of the minimum length.
5.	Accept a name of four characters and print all the possibly string after jumbling up the characters.
6.	Use a sub procedures to accept the month and year in number and then print the calendar of it.
7.	In a function accept two names as parameters by value then concatenate them and return the concatenated string back to the calling sub procedure "print" which will print it on the screen.
8.	Accept the details of 10 employees, their name,age,salary and city and then print the total of salary grouped by city.
9.	Make a class Industry which extends its member function "RegulatoryBoard" in all of its subclasses "Films","Real State","Medicine","Insurance" .this function when called by any object of any particular subclass should print the name of the head of the department.

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
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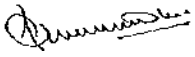
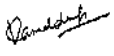
10.	**A class "insurance" displays the product details using its function "productdet".productdet displays just the name and company of the products if the customer name as a string variable is passed to it as the only argument.but if the argument passed to the same function includes age as number it should displays the name of the product ,its company and the insurance premium.**
11.	**An organization having several wings, has introduced some named rule which are must to be used by all of its wings. These rules are open to be implemented in different ways according to the wing using it. Write a program which represent rules in the form of functions and the wings as classes.**
12.	**Accept the details of ten students which includes their name, age and department. If in case any name accepted is less than 3 and greater than 12 (including space)in length an exception "checklenght" should get fired.**
13.	**Use the exception classes such as Arithmetic Exception, Overflow Exception and Exception in such a way that it shows how exceptions are tracked from specific to general.**
14.	**Design a form visually by adding three labels,three text boxes, two comboboxes and two buttons, in which after clicking the save button it should be checked that none of the textboxes are blank and a choice has been made from each of the comboboxes. Labe1 is for Name,Label2 is for age and Label3 is for**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
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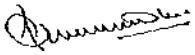
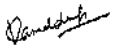
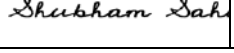
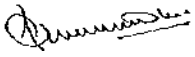
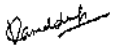
	salary. Textbox1 is for name,textbox2 is for age and textbox3 is for salary. Combobox1 is for designation and combobox2 is for department. Button1 is for Save and button2 is for reset.
15.	Make a form on which a label with a font size of 24 should display the integer value starting from 0 and getting changed on each tick of the timer based on the value of the label a progressbar should continue its value from 1 to 100.
16.	Make a form that should display all the pictures(at least 10)of the imagelist one by one in the picturebox keeping a gap of 1 second each.
17.	Visually design a form having two panels. The first to accept the basic details of the candidate and another to accept the educational details of the candidate. Place the controls to capture these details in both the panels.if the data entry related validations are done properly save the details of the form on to a file.Repeat this for 10 candiadtes.
18.	A picture box in not of such a size which can give the complte view of an image use the required control which can help to see the complete image after dragging it left ,right,up and down.
19.	Design a form visually which should be as a text editor and it uses color dialog box and font dialog box to select the color, font, style and size of the text written into it. These should be a menu on the top in

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

	which a menuitem "save" should save the content(text written inside)as a file on the hard disk.
20.	**Make a window form in which the entire form should be colored to red, green, yellow or blue in response to the toolbar option button click. The form having a toolbar should have button for red, green, yellow and blue.**
21.	**Make a calculator form where the designing should be done using code. The same form should have a status bar with three panels first for having date, second for having time and the third for having a good morning wish as string written.**
22.	**Make a form in code which should be used as a drawing board in which one can make sketches by moving the cursor on the form while the left mouse button is pressed.**
23.	**Use ADO.Net to store the details of the books in the library into a database in Ms-Access.**
24.	**Make different forms in order to accept,update,delete records from a product table. Use SQLDataAdapter,SQLConnction,SQLCommand and Dataset to handle the database.**
25.	**Create a setup file for the standard calculator developed as per the specification mentioned in the question no. 18.**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
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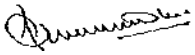
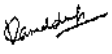
VI. Database Management System as Core Course 10(CC10) i.e. CC10

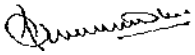
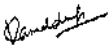
Database Management System as Core Course 10(CC10) i.e. CC10									
Paper Code	Paper Name	Paper Type	Total Credits	Full Marks	Pass Marks	Attendance	MSE	ESE (Theory)	ESE (Practical and Viva Voce)
CC10	Database Management System	Theory (With Practical) (Without Tutorial)	6	100	40	0	15	60	25
Legend: MSE→ Mid Semester Examination ESE→ End Semester Examination									

Lecture Scheme: Database Management System as Core Course 10(CC10) i.e. CC10						
Credits	Paper Type	Lectures per Semester		Lectures per Week		Tutorial
		Theory	Practical	Theory	Practical	
6	Theory (with Practical) (without Tutorials)	60	60	6	6	0

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Course Objective	
The subject aims to provide the student with	
SL. No.	Objective
1.	An understanding of basic concepts of DBMS.
2.	An introduction to the Entity Relationship Models.
3.	An understanding of Relational Algebra.
4.	An induction to constraints, View and SQL.
5.	An introduction to Transactions.

Course Learning Outcome	
After completion of this course students will be able to:	
COs	Outcome
CO1	Explain the needs of DBMS.
CO2	Explain the working of ER models.
CO3	Demonstrate the use of Relational Algebra.
CO4	Explain the usage of constraints, View and SQL.
CO5	Demonstrate the concepts of Transactions and ACID property.

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
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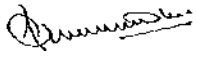
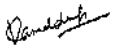
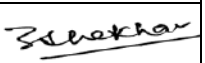
Instruction to Examiners / Question Setters and Marking Scheme for Mid Semester and End Semester Examination
Theory
Mid Semester Examination • There will be TWO Group of Questions. • Group A is COMPULSORY and will contain FIVE Questions of Very Short Answer Type Questions consisting of 1 Marks each. • Group B will contain Descriptive Type THREE Questions of Five Marks each, out of which any TWO Questions are to be answered.
End Semester Examination • There will be TWO Group of Questions. • Group A is COMPULSORY and will contain THREE Questions. • Question Number 1 will be Very Short Answer Type Questions consisting of Five Sub Questions of 1 Marks each. • Question Number 2 and Question Number 3 will be Short Answer Type Questions of 5 Marks each. • Group B will contain Descriptive Type FIVE Questions of 15 Marks each, out of which any THREE are to be answered. **Note:** There may be sub divisions in each question asked in Theory Examinations.

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
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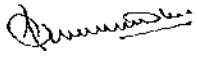
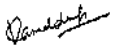
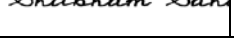
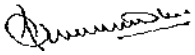
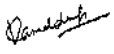
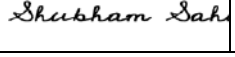
Instruction to Examiners / Question Setters and Marking Scheme for Mid Semester and End Semester Examination	
Practical and Viva Voce	
Mid Semester Examination • **No Mid Semester Examination**	
End Semester Examination	
Lab: **Student have to Answer the given questions on Answer booklet and execute the answered programs/steps in computer with standard output.**	
Assignment: **The Assignment should be hand written in A4 Size Paper.** **First three pages (i.e. front page, acknowledgment, index) & Bibliography may be printout.**	
Questions: **There will be Four Questions from the Respective Core Paper in Practical Examination, out of which any TWO is to be answered.**	
Distribution of Marks	
Lab (Experiment + Answer Script)	**15**
Assignment	**5**
Viva Voce	**5**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

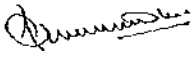
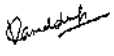
Course Contents: Database Management System as Core Course 10(CC10) Theory i.e. CC10		
Unit	**Course Contents**	**Lectures**
1.	Introduction to DBMS, Purpose, difference with respect to conventional file processing system, data abstraction, data independence, data models (object-based, record based, physical data models), database manager, database administrator, overall system structure.	10
2.	Entity- Relationship model, Relationship sets, Mapping, Keys and entity sets. Entity- Relationship diagram, specialization, generalization and aggregation, database schema under relational model.	6
3.	Relational algebra –Project, select, Cartesian product, joins, natural join, union, intersection, minus, division operations.	8
4.	Normalization – Functional dependency, INF, 2NF, 3NF, BCNF, Multi valued dependency & 4NF. Lossless joins, dependency preservation, redundancy control and integrity preservation during decomposition.	8
5.	Transaction- concepts, transaction state, concurrent executions, serializability, conflict serializability, view serializability.	10
6.	Concurrency control-locks, granting of locks, timestamps based protocols, deadlock prevention,	10

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

	detection & recovery. Security & integrity violation. Authorization, views.	
7.	Oracle functions, SQL (DDL, DML), simple queries, nested sub- queries, self join, equijoin, non-equijoin.	8

Text Books	
SL. No.	Details of Book
1.	R. Elmasri, S.B. Navathe, Fundamentals of Database Systems 6th Edition, Pearson Education, 2010.
2.	R. Ramakrishanan, J. Gehrke, Database Management Systems 3rd Edition, McGraw-Hill, 2002.
3.	A. Silberschatz, H.F. Korth, S. Sudarshan, Database System Concepts 6th Edition, McGraw Hill, 2010.
4.	Ivan Byross - PL/SQL Programming.

Reference Books	
1.	Toby Teory et al., Database Modelling and Design, Morgan Kaufman Publishers.
2.	C. J. Date - Database Management System.
3.	Alexis Leon, Mathews Leon – SQL A Complete Reference, TMH.
4.	V.P. Desai - Database Management System.
5.	Sharad Maheswari and Ruchin jain–SQL and PL/SQL Programming's.

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
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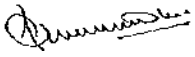
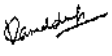
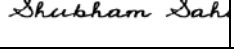
Course Contents: Database Management System as Core Course 10 (CC10) Practical i.e. CC10 Lab	
Program	**Course Contents**
Section I	
1.	**Query to display Employee Name, Job, Hire Date, Employee Number; for each employee with the Employee Number appearing first.**
2.	**Query to display unique Jobs from the Employee Table.**
3.	**Query to display the Employee Name concatenated by a Job separated by a comma.**
4.	**Query to display all the data from the Employee Table. Separate each Column by a comma and name the said column as THE_OUTPUT.**
5.	**Query to display the Employee Name and Salary of all the employees earning more than $2850.**
6.	**Query to display Employee Name and Department Number for the Employee No= 7900.**
7.	**Query to display Employee Name and Salary for all employees whose salary is not in the range of $1500 and $2850.**
8.	**Query to display Employee Name and Department No. of all the employees in Dept 10 and Dept 30 in the alphabetical order by name.**
9.	**Query to display Name and Hire Date of every Employee who was hired in 1981.**
10.	**Query to display Name and Job of all employees who don't have a current Manager.**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Section II	
1.	Query to display the Name, Salary and Commission for all the employees who earn commission.
2.	Sort the data in descending order of Salary and Commission.
3.	Query to display Name of all the employees where the third letter of their name is _A'.
4.	Query to display Name of all employees either have two _R's or have two _A's in their name and are either in Dept No = 30 or their Manger's Employee No = 7788.
5.	Query to display Name, Salary and Commission for all employees whose Commission Amount is 14 greater than their Salary increased by 5%.
6.	Query to display the Current Date.
7.	Query to display Name, Hire Date and Salary Review Date which is the 1st Monday after six months of employment.
8.	Query to display Name and calculate the number of months between today and the date each employee was hired.
9.	Query to display the following for each employee <E-Name> earns < Salary> monthly but wants < 3 * Current Salary >. Label the Column as Dream Salary.
10.	Query to display Name with the 1st letter capitalized and all other letter lower case and length of their name of all the employees whose name starts with _J', 'A' and _M'.

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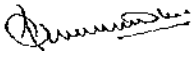
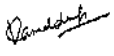
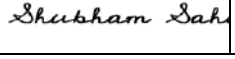
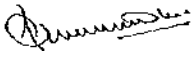
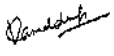
VII. Core Course Practical 4(CP4): C9 Lab and C10 Lab

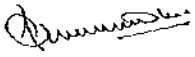
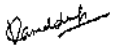
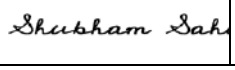
Core Course Practical 4(CP4): CC9 Lab and CC10 Lab									
Paper Code	**Paper Name**	**Paper Type**	**Total Credits**	**Full Marks**	**Pass Marks**	**MSE**	**Assignment**	**ESE (Lab (Experiment + Answer script))**	**Viva Voce**
C9 Lab	**Software Engineering Lab**	**Practical**	**2**	**25**		**0**	**5**	**15**	**5**
C10 Lab	**Database Management System Lab**	**Practical**	**2**	**25**		**0**	**5**	**15**	**5**
CP4		**Practical**	**4**	**50**	**20**	**0**	**10**	**30**	**10**
Legend: **MSE→ Mid Semester Examination** **ESE→ End Semester Examination**									

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

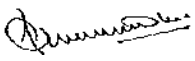
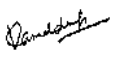
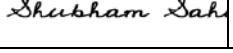
Lecture Scheme: Core Course Practical 4(CP4): CC9 Lab and CC10 Lab						
Credits	Paper Type	Lectures per Semester		Lectures per Week		Tutorial
		Theory	Practical	Theory	Practical	
4	Practical (with Theory) (without Tutorial)	60 + 60	60 + 60	6 + 6	6 + 6	0 + 0

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Core Course Practical 4(CP4): CC9 Lab and CC10 Lab Instruction to Examiners / Question Setters and Marking Scheme for Mid Semester and End Semester Examination	
Mid Semester Examination • **No Mid Semester Examination**	
End Semester Examination • **There will be TWO GROUPS of Questions in Practical Examination of 3 Hours.** • **Group A: Questions from Core Paper 9(CC9) will contain FOUR Questions, out of which any TWO Questions are to be answered.** • **Group B: Questions from Core Paper 10(CC10) will contain TWO Questions, out of which any ONE Question is to be answered.**	
Lab: **Student have to Answer the given questions on Answer booklet and execute the answered programs/steps in computer with standard output.**	
Assignment: **The Assignment should be hand written in A4 size paper. First three pages (i.e. front page + acknowledgment + index) & Bibliography may be printout.**	
Marks Distribution:	
Lab (Experiment + Answer Script)	**30 Marks (15 Marks + 15 Marks)**
Assignment	**10 Marks (5 marks + 5 Marks)**
Viva Voce	**10 Marks (5 marks + 5 Marks)**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Fifth Semester

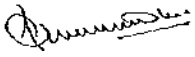
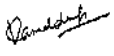
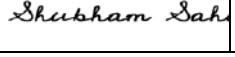
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

I. Information Security as Discipline Specific Elective Course 1(DSE1) Theory i.e. DSE1

Information Security as Discipline Specific Elective Course 1(DSE1)									
Paper Code	Paper Name	Paper Type	Total Credits	Full Marks	Pass Marks	Attendance	MSE	ESE (Theory)	ESE (Practical and Viva Voce)
DSE1	Information Security	Theory (With Practical) (Without Tutorial)	6	100	40	0	15	60	25
Legend: MSE→ Mid Semester Examination ESE→ End Semester Examination									

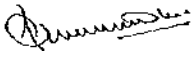
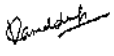
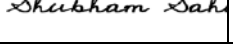
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Lecture Scheme: Information Security as Discipline Specific Elective Course 1(DSE1)						
Credits	Paper Type	Lectures per Semester		Lectures per Week		Tutorial
		Theory	Practical	Theory	Practical	
6	Theory (with Practical) (without Tutorial)	60	60	6	6	0

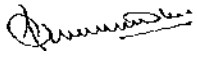
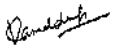
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Course Objective	
The subject aims to provide the student with	
SL. No.	Objective
1.	To understand the concept of information security.
2.	To understand the concept of cryptography.
3.	To understand the concept of database security.
4.	To understand the concept of security over networks.
5.	To understand the concept of administration of security.

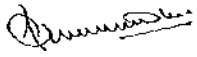
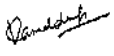
Course Learning Outcome	
After completion of this course students will be able to:	
COs	Outcome
CO1	Identify and explain risk and potential security issues.
CO2	Examine and apply the fundamental techniques of computer security.
CO3	Demonstrate responsible computer use as it deals with social, political, legal and ethical issues in today's electronic society.
CO4	Demonstrate foundation knowledge of information security/assurance within the organization.
CO5	Demonstrate knowledge of security objectives and policy development.

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

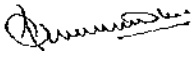
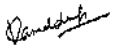
Instruction to Examiners / Question Setters and Marking Scheme for Mid Semester and End Semester Examination
Theory
Mid Semester Examination • There will be TWO Group of Questions. • Group A is COMPULSORY and will contain FIVE Questions of Very Short Answer Type Questions consisting of 1 Marks each. • Group B will contain Descriptive Type THREE Questions of Five Marks each, out of which any TWO Questions are to be answered.
End Semester Examination • There will be TWO Group of Questions. • Group A is COMPULSORY and will contain THREE Questions. • Question Number 1 will be Very Short Answer Type Questions consisting of Five Sub Questions of 1 Marks each. • Question Number 2 and Question Number 3 will be Short Answer Type Questions of 5 Marks each. • Group B will contain Descriptive Type FIVE Questions of 15 Marks each, out of which any THREE are to be answered. **Note:** There may be sub divisions in each question asked in Theory Examinations.

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Instruction to Examiners / Question Setters and Marking Scheme for Mid Semester and End Semester Examination	
Practical and Viva Voce	
Mid Semester Examination • **No Mid Semester Examination**	
End Semester Examination	
Lab: **Student have to Answer the given questions on Answer booklet and execute the answered programs/steps in computer with standard output.**	
Assignment: **The Assignment should be hand written in A4 Size Paper.** **First three pages (i.e. front page, acknowledgment, index) & Bibliography may be printout.**	
Questions: **There will be Four Questions from the Respective Discipline Specific Elective Paper in Practical Examination, out of which any TWO is to be answered.**	
Distribution of Marks	
Lab (Experiment + Answer Script)	**15**
Assignment	**5**
Viva Voce	**5**

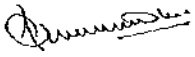
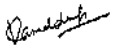
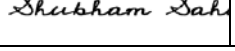
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Course Contents: Information Security as Discipline Specific Elective Course 1(DSE1) Theory i.e. DSE1		
Unit	**Course Contents**	**Lectures**
1.	Introduction Security, Attacks, Computer Criminals, Security Services, Security Mechanisms.	8
2.	Cryptography Substitution ciphers, Transpositions Cipher, Confusion, diffusion, Symmetric, Asymmetric Encryption. DES Modes of DES, Uses of Encryption, Hash function, key exchange, Digital Signatures, Digital Certificates.	10
3.	Program Security Secure programs, Non malicious Program errors, Malicious codes virus, Trap doors, Salami attacks, Covert channels, Control against program.	10
4.	Threats Protection in OS: Memory and Address Protection, Access control, File Protection, User Authentication.	10
5.	Database Security	7

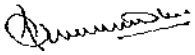
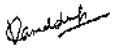
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

	Requirements, Reliability, Integrity, Sensitive data, Inference, Multilevel Security.	
6.	**Security in Networks** **Threats in Networks, Security Controls, firewalls, Intrusion detection systems, Secure e-mails.**	**5**
7.	**Administrating Security** **Security Planning, Risk Analysis, Organizational Security Policy, Physical Security. Ethical issues in Security: Protecting Programs and data. Information and law.**	**10**

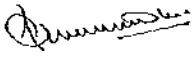
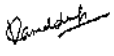
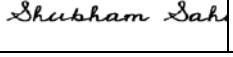
Text / Reference Books	
SL. No.	**Details of Book**
1.	**C. P. Pfleeger, S. L. Pfleeger; Security in Computing, Prentice Hall of India, 2006**
2.	**W. Stallings; Network Security Essentials: Applications and Standards, 4/E, 2018**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Course Contents: Information Security as Discipline Specific Elective 1(DSE1) Practical i.e. DSE1 Lab	
Program	**Program Statement**
1.	**Demonstrate the use of Network Tools:** **a. ping** **b. ipconfig** **c. ifconfig** **d. tracert** **e. arp** **f. netstat** **g. whois**
2.	**Use of Password Cracking Tools:** **a. John the Ripper** **b. Ophcrack** **Verify the strength of passwords using these tools.**
3.	**Perform encryption and decryption of Caesar Cipher. Write a script for performing these operations.**
4.	**Perform Encryption and Decryption of a Rail Fence Cipher.** **Write a script for performing these operations.** **Use nmap/zenmap to analyse a remote machine.**
5.	**Use Burp Proxy to capture and modify the message.**
6.	**Demonstrate sending of a protected word document.**
7.	**Demonstrate sending of a digitally signed document.**

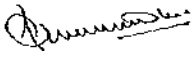
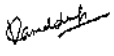
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

8.	**Demonstrate sending of a protected worksheet.**
9.	**Demonstrate use of steganography tools.**
10.	**Demonstrate use of gpg utility for signing and encrypting purposes.**

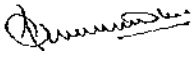
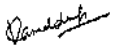
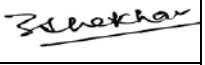
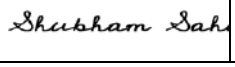
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

II. Python Programming as Discipline Specific Elective Course 2(DSE2) i.e. DSE2

Python Programming as Discipline Specific Elective Course 2(DSE2)									
Paper Code	Paper Name	Paper Type	Total Credits	Full Marks	Pass Marks	Attendance	MSE	ESE (Theory)	ESE (Practical and Viva Voce)
DSE2	Python Programming	Theory (With Practical) (Without Tutorial)	6	100	40	0	15	60	25
Legend: MSE→ Mid Semester Examination ESE→ End Semester Examination									

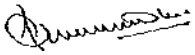
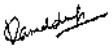
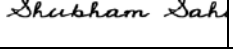
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Lecture Scheme: Python Programming as Discipline Specific Elective Course 2(DSE2) i.e. DSE2						
Credits	Paper Type	Lectures per Semester		Lectures per Week		Tutorial
		Theory	Practical	Theory	Practical	
6	Theory (with Practical) (without Tutorials)	60	60	6	6	0

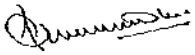
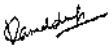
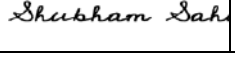
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Course Objective	
The subject aims to provide the student with	
SL. No.	Objective
1.	To define the structure and components of a Python program.
2.	To learn how to write loops and decision statements in Python.
3.	To learn how to write functions and pass arguments in Python.
4.	To learn how to build and package Python modules for reusability.
5.	Implementing OOPs concept in Python.

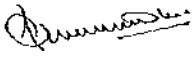
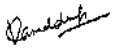
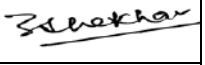
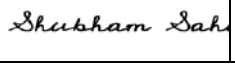
Course Learning Outcome	
After completion of this course students will be able to:	
COs	Outcome
CO1	To Create your first program in Python IDLE.
CO2	To Implement OOPs concepts in your programming.
CO3	To Use Arrays, and Data structures.
CO4	To Create an application with the support of graphics in Python.
CO5	To Implement error handling mechanism.

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

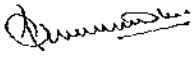
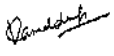
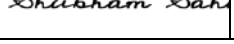
Instruction to Examiners / Question Setters and Marking Scheme for Mid Semester and End Semester Examination
Theory
Mid Semester Examination • There will be TWO Group of Questions. • Group A is COMPULSORY and will contain FIVE Questions of Very Short Answer Type Questions consisting of 1 Marks each. • Group B will contain Descriptive Type THREE Questions of Five Marks each, out of which any TWO Questions are to be answered.
End Semester Examination • There will be TWO Group of Questions. • Group A is COMPULSORY and will contain THREE Questions. • Question Number 1 will be Very Short Answer Type Questions consisting of Five Sub Questions of 1 Marks each. • Question Number 2 and Question Number 3 will be Short Answer Type Questions of 5 Marks each. • Group B will contain Descriptive Type FIVE Questions of 15 Marks each, out of which any THREE are to be answered. **Note:** There may be sub divisions in each question asked in Theory Examinations.

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Instruction to Examiners / Question Setters and Marking Scheme for Mid Semester and End Semester Examination	
Practical and Viva Voce	
Mid Semester Examination • **No Mid Semester Examination**	
End Semester Examination	
Lab: **Student have to Answer the given questions on Answer booklet and execute the answered programs/steps in computer with standard output.**	
Assignment: **The Assignment should be hand written in A4 Size Paper.** **First three pages (i.e. front page, acknowledgment, index) & Bibliography may be printout.**	
Questions: **There will be TWO Questions from the Respective Discipline Specific Elective Paper in Practical Examination, out of which any ONE is to be answered.**	
Distribution of Marks	
Lab (Experiment + Answer Script)	**15**
Assignment	**5**
Viva Voce	**5**

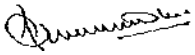
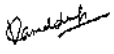
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Course Contents: python Programming as Discipline Specific Elective Course 2(DSE2) Theory i.e. DSE2		
Unit	**Course Contents**	**Lectures**
1.	**Planning the Computer Program:** **Concept of problem solving, Problem definition, Program design, Debugging, Types of Errors in Programming, Documentation**	**10**
2.	**Techniques of Problem Solving:** **Flowcharting, Decision Table, Algorithms, Structured Programming Concepts, Programming Methodologies viz. Top – Down and Bottom – Up Programming.**	**10**
3.	**Overview of Programming:** **Structure of a Python Program, Elements of Python, Writing and Executing Python Programs.**	**10**
4.	**Introduction to Python:** **Python Interpreter, Using Python as calculator, Python shell, Indentation. Atoms, Identifiers and keywords, Literals, Strings, Operators(Arithmetic operator, Relational operator, Logical or Boolean operator, Assignment, Operator, Ternary operator, Bit wise operator, Increment or Decrement operator)**	**10**
5.	**Creating Python Programs:** **Input and Output Statements, Control statements (Branching, Looping, Conditional Statement, Exit function, Difference between break, continue and**	**20**

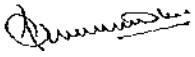
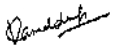
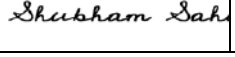
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

	pass.), Defining Functions, default arguments, Function Calls, Variable Scope and Lifetime, return statement, Anonymous Functions, Recursive Functions, Modules, Functions from math, Python File Handling, File Object, File Types, File Operations, Opening and Closing Files, Reading and Writing Files	

Text / Reference Books	
SL. No.	**Details of Book**
1.	**T. Budd, Exploring Python, TMH, 1st Ed, 2011**
2.	**Python Tutorial/Documentation www.python.or 2015**
3.	**Allen Downey, Jeffrey Elkner, Chris Meyers , How to think like a computer scientist : learning with Python, Freely available online.2012**
4.	**http://docs.python.org/3/tutorial/index.html**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Course Contents: Python Programming as Discipline Specific Elective 2(DSE2) Practical i.e. DSE2 Lab	
Program	**Program Statement**
Section 1: Simple Programs	
1.	**Write a menu driven program to convert the given temperature from Fahrenheit to Celsius and vice versa depending upon users choice.**
2.	**WAP to calculate total marks, percentage and grade of a student. Marks obtained in each of the three subjects are to be input by the user. Assign grades according to the following criteria :** **a. Grade A: Percentage >=80** **b. Grade B: Percentage>=70 and <80** **c. Grade C: Percentage>=60 and <70** **d. Grade D: Percentage>=40 and <60** **e. Grade E Percentage<40**
3.	**Write a menu-driven program, using user-defined functions to find the area of rectangle, square, circle and triangle by accepting suitable input parameters from user.**
4.	**WAP to display the first n terms of Fibonacci series.**
5.	**WAP to find factorial of the given number.**
6.	**WAP to find sum of the following series for n terms: 1 – 2/2! + 3/3! - - - - - n/n!**
7.	**WAP to calculate the sum and product of two compatible matrices.**
Section – II: Visual Python	

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

All the programs should be written using user defined functions, wherever possible.	
1.	**Write a menu-driven program to create mathematical 3D objects** **a. curve** **b. sphere** **c. cone** **d. arrow** **e. ring** **f. cylinder**
2.	**WAP to read n integers and display them as a histogram.**
3.	**WAP to display sine, cosine, polynomial and exponential curves.**
4.	**WAP to plot a graph of people with pulse rate p vs. height h. The values of p and h are to be**
5.	**WAP to calculate the mass m in a chemical reaction. The mass m (in gms) disintegrates according to the formula m=60/(t+2), where t is the time in hours. Sketch a graph for t vs. m, where t>=0.**
6.	**A population of 1000 bacteria is introduced into a nutrient medium. The population p grows as follows:** **a. $P(t) = (15000(1+t))/(15+ e)$** **where the time t is measured in hours.** **WAP to determine the size of the population at given time t and plot a graph for P vs t for the specified time interval.**

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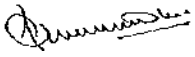
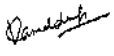
7.	**Input initial velocity and acceleration, and plot the following graphs depicting equations of motion:** **a. velocity wrt time (v=u+at)** **b. distance wrt time (s=u*t+0.5*a*t*t)** **c. distance wrt velocity (s=(v*v-u*u)/2*a)**
8.	**WAP to show a ball bouncing between 2 walls. (Optional)**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
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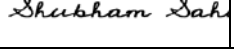
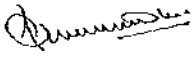
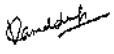
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

III. Discipline Specific Elective Course Practical 1(EP1): DSE1 Lab and DSE2 Lab

Discipline Specific Elective Course Practical 1(EP1): DSE1 Lab and DSE2 Lab									
Paper Code	Paper Name	Paper Type	Total Credits	Full Marks	Pass Marks	MSE	Assignment	ESE (Lab (Experiment + Answer script))	Viva Voce
DSE1 Lab	Information Security Lab	Practical	2	25	20	0	5	15	5
DSE2 Lab	Python Programming Lab	Practical	2	25		0	5	15	5
EP1		Practical	4	50	20	0	10	30	10
Legend: MSE→ Mid Semester Examination ESE→ End Semester Examination									

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
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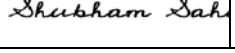
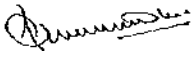
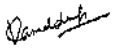
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Lecture Scheme: Discipline Specific Elective Course Practical 1(EP1): DSE1 Lab and DSE2 Lab						
Credits	Paper Type	Lectures per Semester		Lectures per Week		Tutorial
		Theory	Practical	Theory	Practical	
4	Practical (with Theory) (without Tutorials)	60 + 60	60 + 60	6 + 6	6 + 6	0 + 0

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
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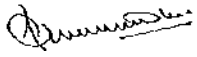
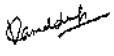
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Discipline Specific Elective Course Practical 1(EP1): DSE1 Lab and DSE2 Lab **Instruction to Examiners / Question Setters and Marking Scheme for Mid Semester and End Semester Examination**	
Mid Semester Examination • **No Mid Semester Examination**	
End Semester Examination • **There will be TWO GROUPS of Questions in Practical Examination of 3 Hours.** • **Group A: Questions from Discipline Specific Elective Paper 1(DSE1) will contain FOUR Questions, out of which any TWO Questions are to be answered.** • **Group B: Questions from Discipline Specific Elective Paper 2(DSE2) will contain TWO Questions, out of which any ONE Question is to be answered.**	
Lab: **Student have to Answer the given questions on Answer booklet and execute the answered programs/steps in computer with standard output.**	
Assignment: **The Assignment should be hand written in A4 size paper. First three pages (i.e. front page + acknowledgment + index) & Bibliography may be printout.**	
Marks Distribution:	
Lab (Experiment + Answer Script)	**30 Marks (15 Marks + 15 Marks)**
Assignment	**10 Marks (5 marks + 5 Marks)**
Viva Voce	**10 Marks (5 marks + 5 Marks)**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
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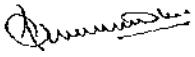
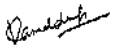
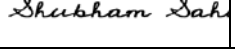
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

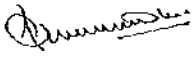
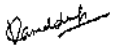
IV. Internet Technologies as Core Course 11(CC11) i.e. CC11

Internet Technologies as Core Course 11(CC11) i.e. CC11									
Paper Code	**Paper Name**	**Paper Type**	**Total Credits**	**Full Marks**	**Pass Marks**	**Attendance**	**MSE**	**ESE (Theory)**	**ESE (Practical and Viva Voce)**
CC11	**Internet Technologies**	**Theory (With Practical) (Without Tutorial)**	**6**	**100**	**40**	**0**	**15**	**60**	**25**
Legend: **MSE→ Mid Semester Examination** **ESE→ End Semester Examination**									

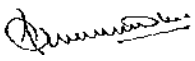
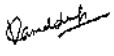
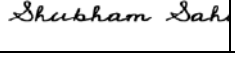
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Lecture Scheme: Internet Technologies as Core Course 11(CC11) i.e. CC11						
Credits	Paper Type	Lectures per Semester		Lectures per Week		Tutorial
		Theory	Practical	Theory	Practical	
6	Theory (with Practical) (without Tutorial)	60	60	6	6	0

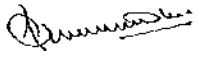
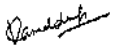
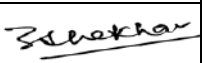
Course Objective	
The subject aims to provide the student with	
SL. No.	Objective
1.	To introduce the fundamentals of Internet, and the principles of web design.
2.	To construct basic websites using HTML and Cascading Style Sheets.
3.	To build dynamic web pages with validation using Java Script objects and by applying different event handling mechanisms.

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

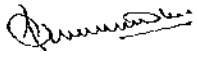
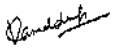
Course Learning Outcome	
After completion of this course students will be able to:	
COs	Outcome
CO1	Understanding the web design concept, planning and development.
CO2	Understand the website goals, business requirements and project plan
CO3	Analyze a web page and identify its elements and attributes.
CO4	Create web pages using HTML and Cascading Style Sheets (CSS).
CO5	Build dynamic web pages using JavaScript (Client side programming).

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Instruction to Examiners / Question Setters and Marking Scheme for Mid Semester and End Semester Examination
Theory
Mid Semester Examination • There will be TWO Group of Questions. • Group A is COMPULSORY and will contain FIVE Questions of Very Short Answer Type Questions consisting of 1 Marks each. • Group B will contain Descriptive Type THREE Questions of Five Marks each, out of which any TWO Questions are to be answered.
End Semester Examination • There will be TWO Group of Questions. • Group A is COMPULSORY and will contain THREE Questions. • Question Number 1 will be Very Short Answer Type Questions consisting of Five Sub Questions of 1 Marks each. • Question Number 2 and Question Number 3 will be Short Answer Type Questions of 5 Marks each. • Group B will contain Descriptive Type FIVE Questions of 15 Marks each, out of which any THREE are to be answered. **Note:** There may be sub divisions in each question asked in Theory Examinations.

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Instruction to Examiners / Question Setters and Marking Scheme for Mid Semester and End Semester Examination	
Practical and Viva Voce	
Mid Semester Examination • **No Mid Semester Examination**	
End Semester Examination	
Lab: **Student have to Answer the given questions on Answer booklet and execute the answered programs/steps in computer with standard output.**	
Assignment: **The Assignment should be hand written in A4 Size Paper.** **First three pages (i.e. front page, acknowledgment, index) & Bibliography may be printout.**	
Questions: **There will be Four Questions from the Respective Core Paper in Practical Examination, out of which any TWO is to be answered.**	
Distribution of Marks	
Lab (Experiment + Answer Script)	**15**
Assignment	**5**
Viva Voce	**5**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
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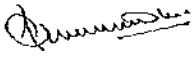
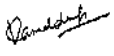
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Course Contents: Internet Technologies as Core Course 11(CC11) Theory i.e. CC11		
Unit	**Course Contents**	**Lectures**
1.	**Introduction to HTML, DHTML and CSS:** **Basics of HTML, Basic HTML tags, HTML Tables, HTML Marquee- Attributes and Behavior; HTML Lists, HTML Frames, HTML Forms, div and span tags. Introduction to DHTML, Difference between HTML and DHTML, Components of DHTML, Document Object Model, Advantages and Disadvantages of DTML, Rollover Buttons, Introduction to Cascading Style Sheets (CSS), Advantages of CSS, CSS Syntax, Types of CSS- Embedded, Inline, External, Selectors used in CSS, CSS Features- Changing Text Color, Background color, Centering Text, Adding Padding, Hover Effects, Font weight, Font size, Applying Color formats, Borders, margins.** **Applying CSS Links, Lists, Tables, Alignment and Image Gallery**	**20**
2.	**JavaScript:** **Overview of JavaScript, Advantages of JavaScript, Basic Programming Techniques, Data Types, Operators and Expressions, Control Structures, Simple programs on JavaScript(for ex. Finding factorial, Fibonacci, power etc.), String properties and methods, Date objects, Screen output and Keyboard input(confirm, prompt, alert), Simple**	**14**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
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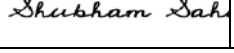
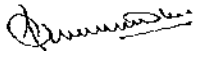
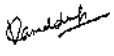
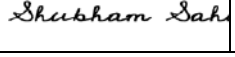
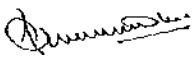
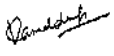
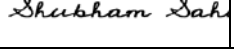
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

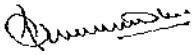
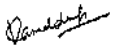
	concept of arrays, Functions in JavaScript (writing programs using functions), JavaScript document object model(DOM), JavaScript object hierarchy model, History objects, Events and Events Handling.	
3.	**JDBC:** **Introduction to JDBC, JDBC Architecture, JDBC Components, JDBC Environment Setup, Types of JDBC drivers, JDBC Establishing Connectivity and working with connection interface, JDBC Database Connections, JDBC-Statements, Prepared Statement and Callable Statement, JDBC Result Sets, JDBC Transactions(Commit, Rollback and Savepoints).**	**12**
4.	**JSP:** **Introduction to Java Server Pages(JSP), HTTP and Servlet Basics, The Problem with Servlets, JSP-Environment Setup, JSP-Architecture, JSP Processing, JSP Life Cycle, Setting Up the JSP Environment, JSP Scriptlet, JSP Declarations, JSP Expression, JSP Comments, JSP Directives, JSP Actions, JSP Implicit Objects, JSP Control-Flow statements(Decision Making and Loop), JSP Operators, JSP Directives, Placing JSP in the web server, JSP- Client request, Conditional Processing, Displaying Values, Using an expression to Set an Attribute, Declaring Variables and Methods, Error Handling and Debugging, Sharing Data Between JSP Pages, Requests, and Users, Database Access.**	**14**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Text / Reference Books	
SL. No.	**Details of Book**
1.	Ivan Bayross, Web Enabled Commercial Application Development Using Html, Dhtml, Javascript, Perl CGI , BPB Publications, 2009.
2.	Cay Horstmann, BIG Java, Wiley Publication , 3rd Edition., 2009
3.	Herbert Schildt , Java 7, The Complete Reference, , 8th Edition, 2009.
4.	Jim Keogh ,The Complete Reference J2EE, TMH, , 2002.
5.	O'Reilly , Java Server Pages, Hans Bergsten, Third Edition, 2003.

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Course Contents: Internet Technology as Core Course 11(CC11) Practical i.e. CC11 Lab	
Program	**Program Statement**
1.	Write a javascript to find the largest of three numbers.
2.	Write a javascript to find the factorial of a number.
3.	Write a javascript to check whether the number is prime or not.
4.	Write a javascript to check whether the number is armstrong or not.
5.	Write a javascript to input a number and then display in words. For ex. 123 should be displayed as one two three.
6.	Write a javascript to demonstrate Math objects.
7.	Write a javascript to find factorial of a number using function.
8.	Write a javascript to generate the fibonacci series.
9.	Write a javascript to find largest number in an array using function.
10.	Write a javascript to demonstrate String properties and methods.
11.	Write a javascript to demonstrate events and event handling.
12.	Write a javascript to demonstrate history object.
13.	Print a table of numbers from 5 to 15 and their squares and cubes using alert.
14.	Print the largest of three numbers.

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
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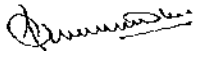
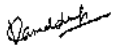
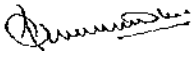
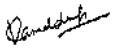
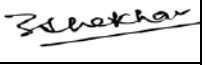
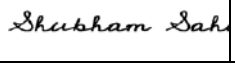
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

15.	Find the factorial of a number n.
16.	Enter a list of positive numbers terminated by Zero. Find the sum and average of these numbers.
17.	A person deposits Rs 1000 in a fixed account yielding 5% interest. Compute the amount in the account at the end of each year for n years.
18.	Read n numbers. Count the number of negative numbers, positive numbers and zeros in the list.
Execute the following JSP programs. Make the use of Tomcat Server wherever needed.	
19.	Write a JSP program to display "Hello World".
20.	Write a JSP program to find the sum of two numbers.
21.	Write a JSP program to print even numbers
22.	Write a JSP program to find factorial of a given number.
23.	Write a JSP program to generate Fibonacci series.
24.	Write a JSP program to enter value between 0 and 6. Now display the weekday according to the value ie. Sunday for "0", Monday for "1" and so on. Make the use of Switch-Case.
25.	Write a JSP program to create a string using the JSP. Save it in a folder inside the Tomcat directory. Finally run it using the Tomcat server.
26.	Write a JSP program for printing "Hello World" for a specified number of times "say n" on the web browser. The value of n should be entered through the browser and then submitted to the server. Now the web server should execute JSP code and should

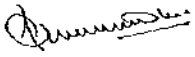
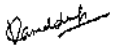
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

	respond with an HTML page displaying "Hello World" n number of times on the Web Browser.
27.	**Write a JSP program to accept the value of n and print numbers from 1 to n. The values of n should be entered in a jsp and the program should be saved under the Tomcat directory. Finally the Tomcat server is executed to display the output.**
28.	**Write a JSP program for displaying the text "JSP Programming" in font-size ranging from 1 to 10 and with font-color "green".**
29.	**Write a JSP program using <jsp:include> directive of Action to display today's date and time. Include two jsp files for ex. "main.jsp" and "date.jsp". Embed date.jsp inside the main.jsp using the <jsp:include> directive.**
30.	**Write a JSP program using <jsp:forward> directive of Action to display today's date and time. Include two jsp files for ex. "main.jsp" and "date.jsp". Embed date.jsp inside the main.jsp using the <jsp:forward> directive.**

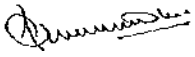
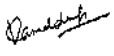
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

V. Software Project Management as Core Course 12(CC12) i.e. CC12

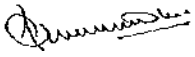
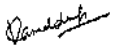
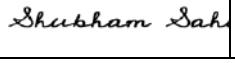
Software Project Management as Core Course 12(CC12) i.e. CC12									
Paper Code	**Paper Name**	**Paper Type**	**Total Credits**	**Full Marks**	**Pass Marks**	**Attendance**	**MSE**	**ESE (Theory)**	**ESE (Practical and Viva Voce)**
CC12	**Software Project Management**	**Theory (with Practical) (without Tutorial)**	**6**	**100**	**40**	**0**	**15**	**60**	**25**
Legend: **MSE→ Mid Semester Examination** **ESE→ End Semester Examination**									

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

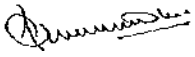
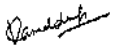
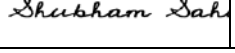
Lecture Scheme: Software Project Management as Core Course 12(C12) i.e. C12						
Credits	Paper Type	Lectures per Semester		Lectures per Week		Tutorial
		Theory	Practical	Theory	Practical	
6	Theory (with Practical) (without Tutorials)	60	60	6	6	0

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

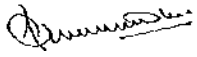
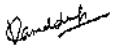
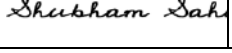
Course Objective	
The subject aims to provide the student with	
SL. No.	Objective
1.	To understand the fundamental principles of software project management.
2.	To have a good knowledge of responsibilities of project manager.
3.	To be familiar with the different methods and techniques used for project
4.	The basic principles of Engineering Software Projects. Most, if not all, students' complete projects as part of assignments in various courses undertaken. These projects range in size, subject and complexity but there are basic project essentials that need to be understood and practiced for successful team project outcomes.
5.	An understanding of the purpose, methods and benefits of process management by exposing the student to the concepts, practices, processes, tools and techniques used in process management for software development.

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

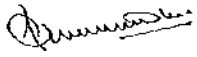
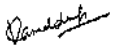
Course Learning Outcome	
After completion of this course students will be able to:	
COs	Outcome
CO1	To understand the basic concepts, terminologies and issues of software project management.
CO2	To apply appropriate methods and models for the development of solutions.
CO3	To analyze the cost-benefits of calculations so as to optimize the selection strategy.
CO4	To evaluate methods, models and technologies towards achieving project success.
CO5	To design and evaluate network planning models with criticality.

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

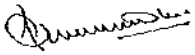
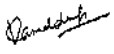
Instruction to Examiners / Question Setters and Marking Scheme for Mid Semester and End Semester Examination
Mid Semester Examination • There will be TWO Group of Questions. • Group A is COMPULSORY and will contain FIVE Questions of Very Short Answer Type Questions consisting of 2 Marks each. • Group B will contain Descriptive Type FOUR Questions of Five Marks each, out of which any THREE Questions are to be answered.
End Semester Examination • There will be TWO Group of Questions. • Group A is COMPULSORY and will contain THREE Questions. • Question Number 1 will be Very Short Answer Type Question consisting of FIVE Sub Questions of 1 Marks each. • Question Number 2 and Question Number 3 will be Short Answer Type Questions of 5 Marks each. • Group B will contain Descriptive Type FIVE Questions of 15 Marks each, out of which any THREE Questions are to be answered. **Note:** **There may be sub divisions in each question asked in Theory Examinations.**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Instruction to Examiners / Question Setters and Marking Scheme for Mid Semester and End Semester Examination	
Practical and Viva Voce	
Mid Semester Examination • **No Mid Semester Examination**	
End Semester Examination	
Lab: **Student have to Answer the given questions on Answer booklet and execute the answered programs/steps in computer with standard output.**	
Assignment: **The Assignment should be hand written in A4 Size Paper.** **First three pages (i.e. front page, acknowledgment, index) & Bibliography may be printout.**	
Questions: **There will be TWO Questions from the Respective Core Paper in Practical Examination, out of which any ONE is to be answered.**	
Distribution of Marks	
Lab (Experiment + Answer Script)	**15**
Assignment	**5**
Viva Voce	**5**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Course Contents : Software Project Management as Core Course 12(CC12) Theory i.e. CC12		
Unit	**Course Contents**	**Lectures**
1.	**Product and Process:** Software Characteristics, Software Applications and Software Crisis, Process, Methods, and Tools and Generic View of Software Engineering, Software Process Models, Linear Sequential Model, Prototyping Model, RAD Model, Evolutionary/Incremental Model, Spiral Model and Agile Model.	8
2.	**Project Management Concepts:** People (Player, Leader & Team), Product (Software scope & Problem decomposition), Process (Melding Product/Process & Process Decomposition) and Project (W5HH Principle and Critical Practices).	8
3.	**Software Project Planning:** SRS, Analysis, Control flow model (Data dictionary, DFDs), Data Modeling (ERDs), Estimating, Planning, Software Scope (Information for Scope/Feasibility), Resources (Human Resources, Reusable Software and Environmental Resources), Software Project Estimation and Decomposition Techniques (Software Sizing, Problem-Based, LOC-Based, FP-Based and Process-Based Estimation) COCOMO II model.	10

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
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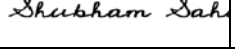
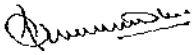
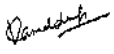
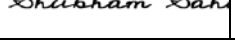
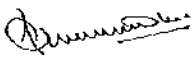
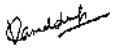
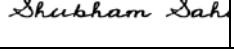
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

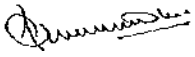
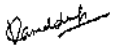
4.	**Project Scheduling and Tracking:** **Basic Concepts & Principles, Relationship Between People and Effort, Defining a Task Network (PERT, CPM), Scheduling (Timeline Charts and Tracking the Schedule).**	**10**
5.	**Design Concepts and Principles** **Software Design Engineering, Design Process, Design Principles, Design Concepts (Abstraction, Refinement, Modularity, Software Architecture, Information Hiding), Effective Modular Design (Functional Independence, Cohesion, Coupling)**	**8**
6.	**Software testing Techniques and Strategies:** **Objectives, Principles & Testability, Test Case Design, White-Box, Basis Path, Control Structure Testing (Condition, Data Flow & Loop Testing), Black-Box, Boundary Value Analysis, Architectures, and Applications, A Strategic Approach to Software Testing, Verification and Validation, Organizing for Software Testing, Software Testing Strategy, Unit Testing, Integration Testing (Top-down, Bottom-up, Regression, Smoke) and System Testing.**	**10**
7.	**Quality and Metrix:** **Quality Concepts (What is quality? ISO 9126 Quality Factors), Factors That Affect Quality, Metrics for Software Quality (Measuring Quality and Defect Removal Efficiency), Process metrics, Project Metrics SQA (Six Sigma for Software Engineering).**	**6**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Text / Reference Books	
SL. No.	**Details of Book**
1.	Roger S. Pressman - Software Engineering A Practitioner's Approach, Mc Graw Hill.
2.	Ali Behforoz and F. J. Hudson - Software Engineering Fundamentals, Oxford University Press.
3.	Alan Dennis and B. H. Wixom – Systems Analysis and Design An Applied Approach, John Wiley.
4.	Carlo Ghezzi, M. Jazayeri and D. Mandrioli - Fundamentals of Software Engineering, PHI.

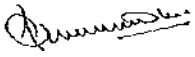
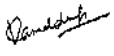
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Course Contents: Software Project Management as Core Course 12(CC12) Practical i.e. CC12 Lab	
Program	**Program Statement**
1.	**Problem Statement:** **Process Model**
2.	**Requirement Analysis:** **Creating a Data Flow, Data Dictionary, Use Cases**
3.	**Project Management:** **Computing FP, Effort, Schedule, Risk Table, Timeline Chart**
4.	**Design Engineering:** **Architectural Design, Data Design, Component Level Design**
5.	**Testing:** **Basis Path Testing**

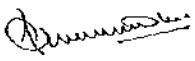
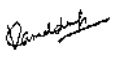
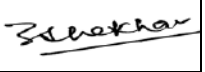
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

VI. Core Course Practical 5(CP5): C11 Lab and CC12Lab

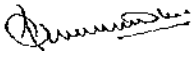
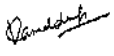
Core Course Practical 5(CP5): CC11 Lab and CC12 Lab									
Paper Code	**Paper Name**	**Paper Type**	**Total Credits**	**Full Marks**	**Pass Marks**	**MSE**	**Assignment**	**ESE (Lab (Experiment + Answer script))**	**Viva Voce**
C11 Lab	**Internet Technologies Lab**	**Practical**	**2**	**25**	**10**	**0**	**5**	**15**	**5**
C12 Lab	**Software Project Management Lab**	**Practical**	**2**	**25**	**10**	**0**	**5**	**15**	**5**
CP5		**Practical**	**4**	**50**	**20**	**0**	**10**	**30**	**10**
Legend: **MSE→ Mid Semester Examination** **ESE→ End Semester Examination**									

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Lecture Scheme: Core Course Practical 5(CP5): CC11 Lab and CC12 Lab						
Credits	Paper Type	Lectures per Semester		Lectures per Week		Tutorial
		Theory	Practical	Theory	Practical	
4	Theory (with Practical) (without Tutorial)	60 + 60	60 + 60	6 + 6	6 + 6	0 + 0

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Core Course Practical 5(CP5): CC11 Lab and CC12 Lab Instruction to Examiners / Question Setters and Marking Scheme for Mid Semester and End Semester Examination	
Mid Semester Examination • No Mid Semester Examination	
End Semester Examination • There will be TWO GROUP of Questions in Practical Examination of 3 Hours. • Group A: Questions from Core Paper 11(CC11) will contain FOUR Questions, out of which any TWO Questions are to be answered. • Group A: Questions from Core Paper 12(CC12) will contain TWO Questions, out of which any ONE Questions are to be answered.	
Lab: Student have to Answer the given questions on Answer booklet and execute the answered programs/steps in computer with standard output.	
Assignment: The Assignment should be hand written in A4 size paper. First three pages (i.e. front page + acknowledgment + index) & Bibliography may be printout.	
Marks Distribution:	
Lab (Experiment + Answer Script)	**30 Marks(15 Marks + 15 Marks)**
Assignment	**10 Marks (5 Marks + 5 Marks)**
Viva Voce	**10 Marks (5 Marks + 5 Marks)**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
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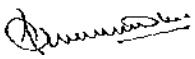
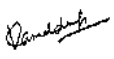
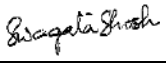
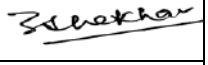
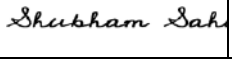
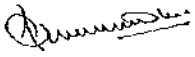
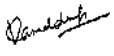
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Sixth Semester

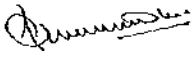
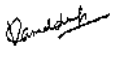
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

I. Cloud Computing as Discipline Specific Elective Course 3(DSE3) i.e. DSE3

Cloud Computing as Discipline Specific Elective Course 3(DSE3) i.e. DSE3									
Paper Code	**Paper Name**	**Paper Type**	**Total Credits**	**Full Marks**	**Pass Marks**	**Attendance**	**MSE**	**ESE (Theory)**	**ESE (Practical and Viva Voce)**
DSE3	**Cloud Computing**	**Theory (with Practical) (without Tutorial)**	**6**	**100**	**40**	**0**	**15**	**60**	**25**
Legend: **MSE→ Mid Semester Examination** **ESE→ End Semester Examination**									

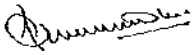
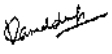
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Lecture Scheme: Cloud Computing as Discipline Specific Elective Course 3(DSE3) i.e. DSE3						
Credits	Paper Type	Lectures per Semester		Lectures per Week		Tutorial
		Theory	Practical	Theory	Practical	
6	Theory (with Practical) (without Tutorial)	60	60	6	6	0

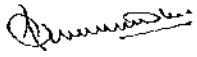
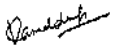
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Course Objective	
The subject aims to provide the student with	
SL. No.	Objective
1.	To learn to use version control systems
2.	To create web applications in the cloud
3.	To learn about virtual machines and work with them
4.	To learn how to design and build a cloud-based application.
5.	To learn how to use Hadoop to implement and use parallel programming
6.	To learn to use version control systems

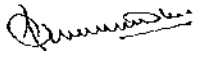
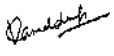
Course Learning Outcome	
After completion of this course students will be able to:	
COs	Outcome
CO1	Configure various virtualization tools such as Virtual Box, VMware workstation.
CO2	Design and deploy a web application in a PaaS environment.
CO3	Learn how to simulate a cloud environment to implement new schedulers.
CO4	Install and use a generic cloud environment that can be used as a private cloud.
CO5	Install and use Hadoop.

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Instruction to Examiners / Question Setters and Marking Scheme for Mid Semester and End Semester Examination
Theory
Mid Semester Examination • There will be TWO Group of Questions. • Group A is COMPULSORY and will contain FIVE Questions of Very Short Answer Type Questions consisting of 1 Marks each. • Group B will contain Descriptive Type THREE Questions of Five Marks each, out of which any TWO Questions are to be answered.
End Semester Examination • There will be TWO Group of Questions. • Group A is COMPULSORY and will contain THREE Questions. • Question Number 1 will be Very Short Answer Type Questions consisting of Five Sub Questions of 1 Marks each. • Question Number 2 and Question Number 3 will be Short Answer Type Questions of 5 Marks each. • Group B will contain Descriptive Type FIVE Questions of 15 Marks each, out of which any THREE are to be answered. **Note:** **There may be sub divisions in each question asked in Theory Examinations.**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Instruction to Examiners / Question Setters and Marking Scheme for Mid Semester and End Semester Examination	
Practical and Viva Voce	
Mid Semester Examination • **No Mid Semester Examination**	
End Semester Examination	
Lab: **Student have to Answer the given questions on Answer booklet and execute the answered programs/steps in computer with standard output.**	
Assignment: **The Assignment should be hand written in A4 Size Paper.** **First three pages (i.e. front page, acknowledgment, index) & Bibliography may be printout.**	
Questions: **There will be FOUR Questions from the Respective Discipline Specific Elective Paper in Practical Examination, out of which any TWO is to be answered.**	
Distribution of Marks	
Lab (Experiment + Answer Script)	**15**
Assignment	**5**
Viva Voce	**5**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
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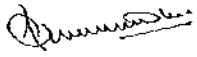
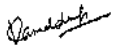
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Course Contents: Cloud Computing as Discipline Specific Elective Course 3(DSE3) Theory i.e. DSE3		
Unit	**Course Contents**	**Lectures**
1.	**Overview of Computing Paradigm** **Recent trends in Computing : Grid Computing, Cluster Computing, Distributed Computing, Utility Computing, Cloud Computing,**	**8**
2.	**Introduction to Cloud Computing** **Introduction to Cloud Computing, History of Cloud Computing, Cloud service providers, Benefits and limitations of Cloud Computing,**	**7**
3.	**Cloud Computing Architecture** **Comparison with traditional computing architecture (client/server), Services provided at various levels, Service Models- Infrastructure as a Service(IaaS), Platform as a Service(PaaS), Software as a Service(SaaS), How Cloud Computing Works, Deployment Models- Public cloud, Private cloud, Hybrid cloud, Community cloud, Case study of NIST architecture.**	**20**
4.	**Case Studies** **Case study of Service model using Google App Engine, Microsoft Azure, Amazon EC2, Eucalyptus.**	**13**
5.	**Service Management in Cloud Computing** **Service Level Agreements(SLAs), Billing & Accounting, Comparing Scaling Hardware:**	**7**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
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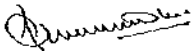
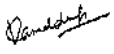
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

	Traditional vs. Cloud, Economics of scaling.	
6.	**Cloud Security** **Infrastructure Security- Network level security, Host level security, Application level security,** **Data security and Storage- Data privacy and security Issues, Jurisdictional issues raised by Data location, Authentication in cloud computing.**	**5**

Text / Reference Books	
SL. No.	**Details of Book**
1.	**Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010**
2.	**Cloud Computing: Principles and Paradigms, Editors: Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Wile, 2011**
3.	**Cloud Computing: Principles, Systems and Applications, Editors: Nikos Antonopoulos, Lee Gillam, Springer, 2012**
4.	**Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Ronald L. Krutz, Russell Dean Vines, Wiley-India, 2010**
5.	**Gautam Shroff, Enterprise Cloud Computing Technology Architecture Applications , Adobe Reader ebooks available from eBooks.com,2010.**
6.	**Toby Velte, Anthony Velte, Robert Elsenpeter, Cloud Computing, A Practical Approach ,McGraw Hills 2010.**
7.	**Dimitris N. Chorafas, Cloud Computing Strategies ,CRC Press, 2010**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
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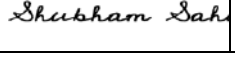
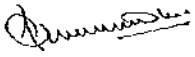
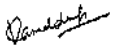
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Course Contents: Cloud Computing as Discipline Specific Elective 3(DSE3) Practical i.e. DSE3 Lab	
Program	**Program Statement**
1.	**Create virtual machines that access different programs on same platform.**
2.	**Create virtual machines that access different programs on different platforms .**
3.	**Working on tools used in cloud computing online-** **a. Storage** **b. Sharing of data** **c. Manage your calendar, to-do lists,** **d. A document editing tool**
4.	**Exploring Google Cloud**
5.	**Exploring Microsoft Cloud**
6.	**Exploring amazon cloud**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
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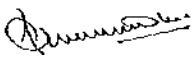
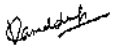
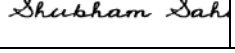
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

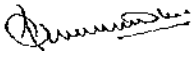
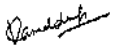
II. On Job Training and Project Work/ Dissertation and Research as Discipline Specific Elective Course 4(DSE4) i.e. DSE4

Project Work/ Dissertation and Research as Discipline Specific Elective Course 4(DSE4) i.e. DSE4A									
Paper Code	**Paper Name**	**Paper Type**	**Total Credits**	**Full Marks**	**Pass Marks**	**Project Report**	**Daily Report**	**Presentation Performance**	**ESE (Practical and Viva Voce)**
DSE4A	**Project Work Dissertation and Research**	**Practical**	**4**	**75**	**30**	**5**	**5**	**5**	**60**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

On Job Training as Discipline Specific Elective Course 4(DSE4) i.e. DSE4B									
Paper Code	Paper Name	Paper Type	Total Credits	Full Marks	Pass Marks	OJT Report	Daily Report	Presentation Performance	ESE (Viva Voce)
DSE4B	On Job Training as Discipline Specific Elective Course	Practical	2	25	10	5	0	5	15
Legend: MSE→ Mid Semester Examination ESE→ End Semester Examination									

Lecture Scheme: Project Work/ Dissertation and Research as Discipline Specific Elective Course 4(DSE4) i.e. DSE4A						
Credits	Paper Type	Lectures per Semester		Lectures per Week		Tutorial
		Theory	Practical	Theory	Practical	
4	Practical)	0	0	0	0	0
Lecture Scheme: On Job Training as Discipline Specific Elective Course 4(DSE4) i.e. DSE4B						
2	Practical	0	0	0	0	0

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
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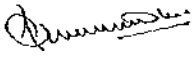
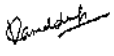
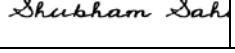
Instruction to Examiners / Question Setters and Marking Scheme for Mid Semester and End Semester Examination
Practical and Viva Voce: Project Work/ Dissertation and Research as Discipline Specific Elective Course 4(DSE4) Practical i.e. DSE4A

Mid Semester Examination
• During Powerpoint Presentation, Evaluation will be done on the basis of following criteria
  • Content
  • Delivery Mode
  • Body Language
  • Logical Flow
  • Query Handling

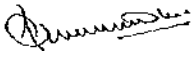
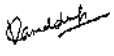
End Semester Examination
• During Viva Voce, evaluation will be done on the basis of
  • Runtime Execution / Browsing of the Project
  • Viva Voce

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Instruction to Examiners / Question Setters and Marking Scheme for Mid Semester and End Semester Examination	
Practical and Viva Voce: On Job Training as Discipline Specific Elective Course 4(DSE4) Practical i.e. DSE4B	

Mid Semester Examination
• During Powerpoint Presentation, Evaluation will be done on the basis of following criteria
  • Content
  • Delivery Mode
  • Body Language
  • Logical Flow
  • Query Handling
• On Job Training Project Report
  • As per prescribed Performa	

End Semester Examination	
Viva Voce:	
Distribution of Marks	
Viva Voce	**15**
On Job Training Project Report	**5**
Powerpoint Presentation Performance	**5**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
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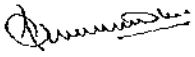
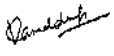
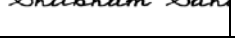
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

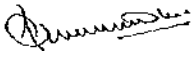
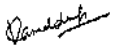
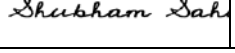
On Job Training (OJT) and Project Work/ Dissertation as Discipline Specific Elective Course 4(DSE4) i.e. DSE4	
DSE4A	**Project Work/ Dissertation and Research as Discipline Specific Elective Course 4(DSE4) Practical i.e. DSE4A**
1.	**The students will be allowed to work on any project based on the concepts studied in core / elective or skill based elective courses.**
2.	**Student have to do a complete project, the technologies (front end + back end) should be chosen among the syllabus, where the front end will be designing & coding portion and back end will be database portion.**
3.	**Student have to run the code as a live project and submit CD containing supporting software, frontend and backend coding in proper format.**
4.	**Final Project Submission contains Hard copy, Soft copy & leave letter.** **Project Hard Copy contains** **a. Front page** **b. Certificate of Authenticity** **c. Certificate of job Trainings (job1+job2)** **d. Declaration** **e. Acknowledgement** **f. Table of content/index** **g. Project guidelines (These points are mandatory)** **i. Introduction with Company profile.** **ii. Vision, mission & objective.**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

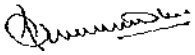
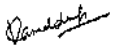
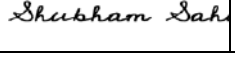
	iii. SWOT Analysis. iv. Chronology of Achievements. v. Topic introduction & discussion. vi. Its relevance & implication in company. vii. Findings. viii. Conclusion ix. Further enhancement (Suggestion). x. Bibliography xi. Reference Website xii. CD (compact Disc) The file should be Book Binding One Project Report for office copy and each candidate must have its own copy.
5.	The Project Report will be submitted in the form specified as under: a. The typing should be done on one sides of the paper. b. The font size should be 12 with Times New Roman font. c. The Project Report may be typed in 1.5 – line spacing. d. The paper should be A4 Size 75 GSM. Two copies meant for the purpose of evaluation may be bound in paper and submitted to the approved authority.
DSE4B	On Job Training (OJT)
1.	Synopsis submission
2.	Synopsis Approval will be given within a week from the date of submission.

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

3.	Synopsis will be approved by concerned department faculty member.
4.	Faculty members will be the internal guide of particular group of Students.
5.	The group size will be minimum of 1 candidate and maximum of 3 candidates.
6.	Group will present power point presentation in front of panel and submit the project status report within the 15 to 20 days from the date of approval.
7.	Final Project Submission contains Hard copy, Soft copy & leave letter. Project Hard Copy contains a. Front page b. Certificate of Authenticity c. Certificate of job Trainings (job1+job2) d. Declaration e. Acknowledgement f. Table of content/index g. Project guidelines (These points are mandatory) i. Introduction with Company profile. ii. Vision, mission & objective. iii. SWOT Analysis. iv. Chronology of Achievements. v. Topic introduction & discussion. vi. Its relevance & implication in company. vii. Findings. viii. Conclusion

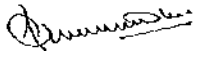
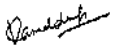
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

	ix. Further enhancement (Suggestion). x. Bibliography xi. Reference Website xii. CD (compact Disc) The file should be Book Binding One Project Report for office copy and each candidate must have its own copy.
8.	Leave Card
9.	The Training Report will be submitted in the form specified as under: a. The typing should be done on both sides of the paper (instead of single side printing) b. The font size should be 12 with Times New Roman font. c. The Training Report may be typed in 1.5 – line spacing. d. The paper should be A4 Size 75 GSM. Two copies meant for the purpose of evaluation may be bound in paper and submitted to the approved authority.

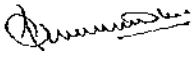
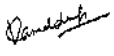
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

III. Discipline Specific Elective Practical 2(EP2): DSE3 Lab and DSE4B i.e. On Job Training

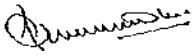
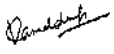
Discipline Specific Elective Practical 2(EP2): DSE3 Lab and DSE4B i.e. On Job Training									
Paper Code	**Paper Name**	**Paper Type**	**Total Credits**	**Full Marks**	**Pass Marks**	**MSE**	**Assignment**	**ESE (Lab (Experiment + Answer script))**	**Viva Voce**
DSE3 Lab	Cloud Computing Lab	Practical	2	25	10	0	5	15	5
Paper Code	**Paper Name**	**Paper Type**	**Total Credits**	**Full Marks**	**Pass Marks**	**MSE**	**OJT Report**	**ESE (Viva Voce)**	**Presentation Performance**
DSE4B	On Job Training	Practical	2	25	10	0	5	15	5
CP6			4	50	20	0	10	30	10
Legend: **MSE→ Mid Semester Examination** **ESE→ End Semester Examination**									

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Lecture Scheme: Discipline Specific Elective Practical 2(EP2): DSE3 Lab and DSE4 Lab						
Credits	Paper Type	Lectures per Semester		Lectures per Week		Tutorial
		Theory	Practical	Theory	Practical	
4	Practical (with Theory) (Without Tutorial)	60 + 00	60 + 00	6 + 0	6 + 0	0 + 0

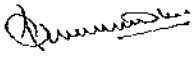
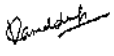
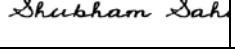
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Discipline Specific Elective Practical 2(EP2): DSE3 Lab and DSE4B Instruction to Examiners / Question Setters and Marking Scheme for Mid Semester and End Semester Examination	
Mid Semester Examination • No Mid Semester Examination	
End Semester Examination • There will be TWO GROUPS of Questions in Practical Examination of 3 Hours. • Group A: Questions from Discipline Specific Elective 3(DSE3) will contain FOUR Questions, out of which any TWO Questions are to be answered. • Group B: Questions from Discipline Specific Elective 4(DSE4B) i.e. will contain ONLY VIVA VOCE.	
Lab: Student have to Answer the given questions on Answer booklet and execute the answered programs/steps in computer with standard output.	
Assignment: The Assignment should be hand written in A4 size paper. First three pages (i.e. front page + acknowledgment + index) & Bibliography may be printout. On Job Training Project Report: As per prescribed Performa.	
Marks Distribution:	
Lab (Experiment + Answer Script)	30 Marks (15 Marks + 15 Marks)
Assignment	10 Marks (5 marks + 5 Marks)
Viva Voce	10 Marks (5 marks + 5 Marks)

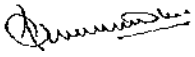
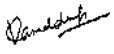
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

IV. Artificial Intelligence as Core Course 13(CC13) i.e. CC13

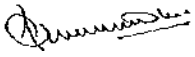
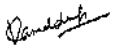
Artificial Intelligence as Core Course 13(CC13) i.e. CC13									
Paper Code	**Paper Name**	**Paper Type**	**Total Credits**	**Full Marks**	**Pass Marks**	**Attendance**	**MSE**	**ESE (Theory)**	**ESE (Practical and Viva Voce)**
CC13	**Artificial intelligence**	**Theory (with Practical) (without Tutorial)**	**6**	**100**	**40**	**0**	**15**	**60**	**25**
Legend: **MSE→ Mid Semester Examination** **ESE→ End Semester Examination**									

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Lecture Scheme: Artificial Intelligence as Core Course 13(C13) i.e. C13						
Credits	Paper Type	Lectures per Semester		Lectures per Week		Tutorial
		Theory	Practical	Theory	Practical	
6	Theory (with Practical) (without Tutorial)	60	60	6	6	0

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Course Objective	
The subject aims to provide the student with	
SL. No.	Objective
1.	To understand of the fundamental concepts and applications of Artificial Intelligence.
2.	To understand the major techniques and technologies used in Machine Learning and their applications in various domains.
3.	To understand Natural Language Processing and its applications in fields.
4.	To understand the ethical considerations related to the use of Artificial Intelligence.
5.	To understand the implications of artificial intelligence on society and the workforce.

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
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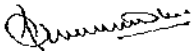
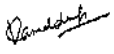
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Course Learning Outcome	
After completion of this course students will be able to:	
COs	Outcome
CO1	Students will be able to define Artificial Intelligence, describe its history and applications, and analyze ethical considerations related to AI.
CO2	Students will be able to understand the basics of Machine Learning, including the different types of algorithms, data preparation, and processing. They will also be able to identify successful Machine Learning projects.
CO3	Students will be able to identify the different techniques used in Natural Language Processing, understand the applications of NLP, and identify the ethical considerations related to NLP.
CO4	Students will be able to identify the different techniques used in Computer Vision, understand the applications of Computer Vision, and identify the ethical considerations related to Computer Vision.
CO5	Students will be able to define Artificial Intelligence, describe its history and applications, and analyze ethical considerations related to AI.

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
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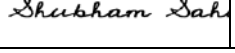
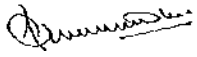
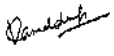
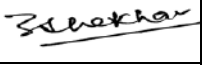
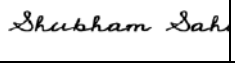
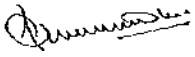
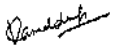
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Instruction to Examiners / Question Setters and Marking Scheme for Mid Semester and End Semester Examination
Theory
Mid Semester Examination • There will be TWO Group of Questions. • Group A is COMPULSORY and will contain FIVE Questions of Very Short Answer Type Questions consisting of 1 Marks each. • Group B will contain Descriptive Type THREE Questions of Five Marks each, out of which any TWO Questions are to be answered.
End Semester Examination • There will be TWO Group of Questions. • Group A is COMPULSORY and will contain THREE Questions. • Question Number 1 will be Very Short Answer Type Questions consisting of Five Sub Questions of 1 Marks each. • Question Number 2 and Question Number 3 will be Short Answer Type Questions of 5 Marks each. • Group B will contain Descriptive Type FIVE Questions of 15 Marks each, out of which any THREE are to be answered. **Note:** There may be sub divisions in each question asked in Theory Examinations.

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Instruction to Examiners / Question Setters and Marking Scheme for Mid Semester and End Semester Examination	
Practical and Viva Voce	
Mid Semester Examination • **No Mid Semester Examination**	
End Semester Examination	
Lab: **Student have to Answer the given questions on Answer booklet and execute the answered programs/steps in computer with standard output.**	
Assignment: **The Assignment should be hand written in A4 Size Paper.** **First three pages (i.e. front page, acknowledgment, index) & Bibliography may be printout.**	
Questions: **There will be Four Questions from the Respective Core Paper in Practical Examination, out of which any TWO is to be answered.**	
Distribution of Marks	
Lab (Experiment + Answer Script)	**15**
Assignment	**5**
Viva Voce	**5**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
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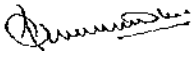
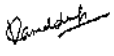
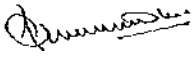
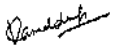
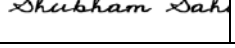
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

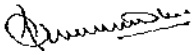
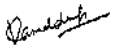
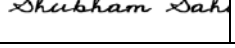
Course Contents: Artificial Intelligence as Core Course 13(C13) Theory i.e. C13		
Unit	**Course Contents**	**Lectures**
1.	Introduction Introduction to Artificial Intelligence, Environment, Background and Applications, Task domains of AI, Turing Test and Rational Agent approaches to AI, Introduction to Intelligent Agents, Various types of Agents and their structure.	5
2.	State Space Search, Heuristic Search, Problem Solving Defining the problem as a State Space search, Strategies for State Space Search, Implementation for Graph Search, Control Strategies, Breadth First Search, Depth First Search, Production System-Characteristics, Generate and Test, Best First Search Heuristic Search Techniques (Hill-climbing Heuristic, Best-first Search), A* algorithm, Constraint Satisfaction Problem, Means-End Analysis, Introduction to Game Playing, Min-Max and Alpha-Beta pruning algorithms.	15
3.	Knowledge Representation Introduction to First Order Predicate Logic, Resolution Principle, Unification, Semantic	10

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

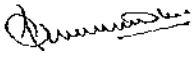
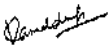
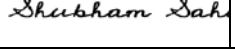
	Nets, Conceptual Dependencies, Frames, and Script, Procedural Versus Declarative Knowledge and Knowledge Acquisition, Conceptual Graphs.	
4.	**Expert Systems** **Introduction, Features, characteristics, Architecture, Goals, Advantages, Difference between Expert System and Conventional Method, Stages in the Development of an Expert System.**	**8**
5.	**Fuzzy Systems** **Introduction, Crisp Sets, Fuzzy sets, Basic terms and operation, Fuzzy Relations, Arithmetic Operations of Fuzzy Numbers, Linguistic Descriptions, Fuzzification.**	**7**
6.	**Artificial Neural Network** **Introduction Artificial Neural Networks Architecture, Features of Artificial Neural Networks, Back propagation Training Algorithms**	**8**
7.	**Dealing with Uncertainties and Inconsistencies Truth Maintenance System, Default Reasoning, Probabilistic Reasoning, Bayesian Probabilistic Inference, Possible World Representations.**	**7**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Text / Reference Books	
SL. No.	**Details of Book**
1.	DAN.W. Patterson, Introduction to A.I and Expert Systems – PHI, 2007.
2.	Russell & Norvig, Artificial Intelligence-A Modern Approach, LPE, Pearson Prentice Hall, 2nd edition, 2005.(Text Book)
3.	Rich & Knight, Artificial Intelligence – Tata McGraw Hill, 2nd edition, 1991.
4.	Ivan Bratko, Prolog Programming for Artificial Intelligence, Addison-Wesley, Pearson Education, 3rd Edition 2000.
5.	Society of Mind by Marvin Minsky(Text Book)
6.	Republic by Aristotle(not to be in Syllabus)

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Course Contents: Artificial Intelligence as Core Course 13(CC13) Practical i.e. CC13 Lab	
Program	**Program Statement**
1.	**Write a prolog program to calculate the sum of two numbers.**
2.	**Write a prolog program to find the maximum of two numbers.**
3.	**Write a prolog program to find the nth Fibonacci series.**
4.	**Write a prolog program to find the factorial of a number.**
5.	**Write a prolog program to implement GCD of 2 numbers.**
6.	**Write a prolog program to implement palindrome.**
7.	**Write a prolog program to implement reverse (list, reversed list) that reverses list.**
8.	**Write a prolog program to implement append for two list.**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

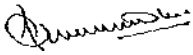
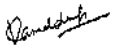
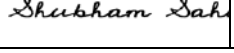
V. Computer Graphics as Core Course 14(CC14) i.e. CC14

Computer Graphics as Core Course 14(C14) i.e. C14									
Paper Code	Paper Name	Paper Type	Total Credits	Full Marks	Pass Marks	Attendance	MSE	ESE (Theory)	ESE (Practical and Viva Voce)
CC14	Computer Graphics	Theory (With Practical) (Without Tutorial)	6	100	40	0	15	60	25
Legend: MSE→ Mid Semester Examination ESE→ End Semester Examination									

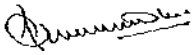
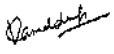
Lecture Scheme: Computer Graphics as Core Course 14(C14) i.e. CC14						
Credits	Paper Type	Lectures per Semester		Lectures per Week		Tutorial
		Theory	Practical	Theory	Practical	
6	Theory (with Practical) (without Tutorial)	60	60	6	6	0

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

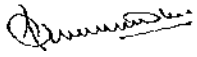
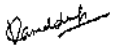
Course Objective	
The subject aims to provide the student with	
SL. No.	Objective
1.	Geometrical Transformations in 2-Dimensional and 3-Dimensional perspectives
2.	Object representations, Surface detection procedures and Computer Animations
3.	To the concepts of computer graphics.
4.	an overview of interactive computer graphics, two dimensional system and mapping, then it presents the most important drawing algorithm, two-dimensional transformation.
5.	The Clipping, filling and an introduction to 3-D graphics.

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

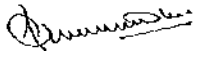
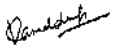
Course Learning Outcome	
After completion of this course students will be able to:	
COs	Outcome
CO1	Understand the basics of computer graphics, different graphics systems and applications of computer graphics.
CO2	Discuss various algorithms for scan conversion and filling of basic objects and their comparative analysis.
CO3	Use of geometric transformations on graphics objects and their application in composite form.
CO4	Extract scene with different clipping methods and its transformation to graphics display device.
CO5	Explore projections and visible surface detection techniques for display of 3D scene on 2D screen. Render projected objects to naturalize the scene in 2D view and use of illumination models for this.

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

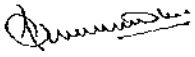
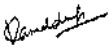
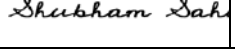
Instruction to Examiners / Question Setters and Marking Scheme for Mid Semester and End Semester Examination
Theory
Mid Semester Examination • There will be TWO Group of Questions. • Group A is COMPULSORY and will contain FIVE Questions of Very Short Answer Type Questions consisting of 1 Marks each. • Group B will contain Descriptive Type THREE Questions of Five Marks each, out of which any TWO Questions are to be answered.
End Semester Examination • There will be TWO Group of Questions. • Group A is COMPULSORY and will contain THREE Questions. • Question Number 1 will be Very Short Answer Type Questions consisting of Five Sub Questions of 1 Marks each. • Question Number 2 and Question Number 3 will be Short Answer Type Questions of 5 Marks each. • Group B will contain Descriptive Type FIVE Questions of 15 Marks each, out of which any THREE are to be answered. **Note:** **There may be sub divisions in each question asked in Theory Examinations.**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Instruction to Examiners / Question Setters and Marking Scheme for Mid Semester and End Semester Examination	
Practical and Viva Voce	
Mid Semester Examination • **No Mid Semester Examination**	
End Semester Examination	
Lab: **Student have to Answer the given questions on Answer booklet and execute the answered programs/steps in computer with standard output.**	
Assignment: **The Assignment should be hand written in A4 Size Paper.** **First three pages (i.e. front page, acknowledgment, index) & Bibliography may be printout.**	
Questions: **There will be TWO Questions from the Respective Core Paper in Practical Examination, out of which any ONE is to be answered.**	
Distribution of Marks	
Lab (Experiment + Answer Script)	**15**
Assignment	**5**
Viva Voce	**5**

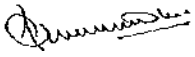
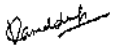
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Course Contents: Computer Graphics as Core Course 14(C14) Theory i.e. CC14		
Unit	**Course Contents**	**Lectures**
1.	**Introduction** Basic elements of Computer Graphics, pixel, resolution, refresh rate, persistence, relation between rate and persistence, Applications of Computer Graphics.	8
2.	**Graphics Hardware** Architecture of Raster and Random scan display devices, CRT, LCD, LED and OLED based displays, input/output devices.	10
3.	**Fundamental Techniques in Graphics** Raster scan line, line drawing algorithm, circle drawing, Filling primitives, Polygon filling, Scan line polygon filling, Seed filling and its approaches, Point clipping, line and polygon clipping algorithms, 2D and 3D Geometric Transformations, translation, scaling and rotation.2D and 3D Viewing Transformations (Projections-Parallel and Perspective),Vanishing points.	20
4.	**Geometric Modeling** Representing Curves, Bezier Curves and their formations, Parametric representation of Bezier curves.	7
5.	**Visible Surface Determination** Hidden surface elimination, Z buffer algorithm for hidden surface elimination.	8
6.	**Surface Rendering**	7

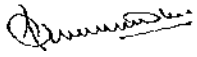
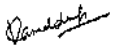
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

	Illumination models. Basic color models, RGB and CMYK models, Elements of Computer Animation.	

Text / Reference Books	
SL. No.	**Details of Book**
1.	**J.D.Foley,A.VanDan,Feiner,HughesComputerGraphicsPrinciples&Practice2nd edition Publication Addison Wesley 1990.**
2.	**D.Hearn,Baker:ComputerGraphics,PrenticeHallofIndia2008.**
3.	**D.F.RogersProceduralElementsforComputerGraphics,McGrawHill1997.**
4.	**D.F.Rogers,AdamsMathematicalElementsforComputerGraphics,McGrawHill2nd edition1989.**

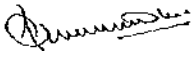
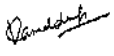
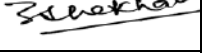
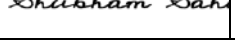
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Course Contents: Computer Graphics as Core Course 14(CC14) Practical i.e. CC14 Lab	
Program	**Program Statement**
1.	**Write a program to implement Bresenham's line drawing algorithm.**
2.	**Write a program to implement mid-point circle drawing algorithm.**
3.	**Write a program to clip a line using Cohen and Sutherland line clipping algorithm.**
4.	**Write a program to clip a polygon using Sutherland Hodgeman algorithm.**
5.	**Write a program to apply various 2D transformations on a 2D object (use homogenous coordinates).**
6.	**Write a program to apply various 3D transformations on a 3D object and then apply parallel and perspective projection on it.**
7.	**Write a program to draw Hermite/Bezier curve.**

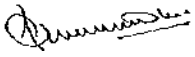
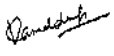
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

VI. Core Course Practical 6(CP6): CC13 Lab and CC14 Lab

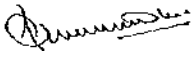
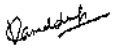
Core Course Practical 6(CP6): CC13 Lab and CC14 Lab									
Paper Code	Paper Name	Paper Type	Total Credits	Full Marks	Pass Marks	MSE	Assignment	ESE (Lab (Experiment + Answer script))	Viva Voce
C13 Lab	Artificial Intelligence Lab	Practical	2	25	10	0	5	15	5
C14 Lab	Computer Graphics Lab	Practical	2	25	10	0	5	15	5
CP6			4	50	20	0	10	30	10
Legend: MSE→ Mid Semester Examination ESE→ End Semester Examination									

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

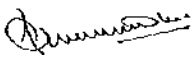
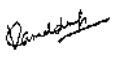
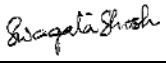
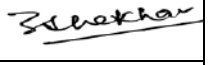
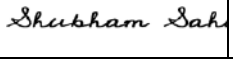
Lecture Scheme: Core Course Practical 6(CP6): CC13 Lab and CC14 Lab						
Credits	Paper Type	Lectures per Semester		Lectures per Week		Tutorial
		Theory	Practical	Theory	Practical	
4	Practical (with Theory) (Without Tutorial)	60 + 60	60 + 60	6 + 6	6 + 6	0 + 0

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Core Course Practical 6(CP6): CC13 Lab and CC14 Lab Instruction to Examiners / Question Setters and Marking Scheme for Mid Semester and End Semester Examination	
Mid Semester Examination • **No Mid Semester Examination**	
End Semester Examination • **There will be TWO GROUPS of Questions in Practical Examination of 3 Hours.** • **Group A: Questions from Core Paper 13(CC13) will contain FOUR Questions, out of which any TWO Questions are to be answered.** • **Group B: Questions from Core Paper 14(CC14) will contain TWO Questions, out of which any ONE Question is to be answered.**	
Lab: **Student have to Answer the given questions on Answer booklet and execute the answered programs/steps in computer with standard output.**	
Assignment: **The Assignment should be hand written in A4 size paper. First three pages (i.e. front page + acknowledgment + index) & Bibliography may be printout.**	
Marks Distribution:	
Lab (Experiment + Answer Script)	**30 Marks (15 Marks + 15 Marks)**
Assignment	**10 Marks (5 marks + 5 Marks)**
Viva Voce	**10 Marks (5 marks + 5 Marks)**

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Annexure

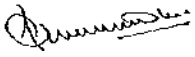
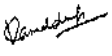
Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Semester Wise Distribution of Credits for Honours Programme

Semester	CC	AECC	GE – A	GE – B	SEC	DSE	Total Credits
First	12	2	6	6			26 (20 + 6)
Second	12	2	6	6			26 (20 + 6)
Third	18		6	6	2		32 (26 + 6)
Fourth	18		6	6	2		32 (26 + 6)
Fifth	12					12	24
Sixth	12					12	24
Total	84	4	24	24	4	24	164 (140 + 24)

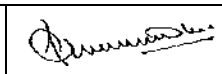
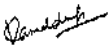
Legends:
CC: Core Course
AECC: Ability Enhancement Compulsory Course
GE: Generic Elective
SEC: Skill Enhancement Course
DSE: Discipline Specific Elective

Note:
In the Academic Council Meeting of Ranchi University, Ranchi, held on 27.02.2019, it is resolved that Students will be offered Two Generic Elective Subjects (GE-A & GE-B) in C.B.C.S. U.G. Honours Courses of all streams, so that their "Eligibility for Admission" in P.G., Vocational & Technical Courses in various Institutions is not hampered.

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
Prof. Swagata Ghosh		Dr. Bhaskar Karn		Dr. Chandrashekhar Azad	
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Sample Calculation for SGPA for B.Sc. (Honours) Programme

Course	Credit	Grade Letter	Grade Point	Credit Point (Credit X Grade)	SPGA (Credit Point / Credit
First Semester					
AECC1	2	B	6	12	
GE1A	6	B	6	36	
GE1B	6	B^+	7	42	180/26 = 6.92
CC1	6	A	8	48	
CC2	6	B^+	7	62	
Total	26			180	
Second Semester					
AECC2	2	B^+	7	14	
GE2A	6	A^+	9	54	
GE2B	6	B^+	7	42	176/26 = 6.76
CC3	6	B	6	36	
CC4	6	C	5	30	
Total	26			176	

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
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Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Course	Credit	Grade Letter	Grade Point	Credit Point (Credit X Grade)	SPGA (Credit Point / Credit
Third Semester					
SEC1	2	A	8	16	280/32 = 8.75
GE3A	6	O	10	60	
GE3B	6	B^+	7	42	
CC5	6	A^+	9	54	
CC6	6	O	10	60	
CC7	6	A	8	48	
Total	32			280	
Fourth Semester					
SEC2	2	A^+	9	18	234/32 = 7.31
GE4A	6	A	8	48	
GE4B	6	B^+	7	42	
CC8	6	B	6	36	
CC9	6	A^+	9	54	
CC10	6	B	6	36	
Total	32			234	

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
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Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Course	Credit	Grade Letter	Grade Point	Credit Point (Credit X Grade)	SPGA (Credit Point / Credit
Fifth Semester					
DSE1	6	O	10	60	186/24 = 7.75
DSE2	6	A	8	48	
CC11	6	B	6	36	
CC12	6	B^+	7	42	
Total	24			186	
Sixth Semester					
DSE3	6	B^+	7	42	192/24 = 8.0
DSE4	6	A	8	48	
CC13	6	A^+	9	54	
CC14	6	A	8	48	
Total	24			192	
CGPA					
Grand Total	164 (140 + 24)			1248	1248/164 = 7.61

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
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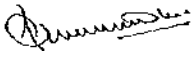
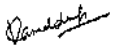
Mr. Shiwanshu Dasgupta		Mr. Shubham Sahay		Conference Hall	29.11.2025 11:00 AM

Sample Calculation for CGPA for B.Sc. (Honours) Programme

Semester	Credit	SGPA	SGPA X Credit	CGPA
First	26	6.92	180	1248 / 164 = 7.61
Second	26	6.76	176	
Third	32	8.75	280	
Fourth	32	7.31	234	
Fifth	24	7.75	186	
Sixth	24	8.0	192	
Total	164 (140 + 24)		1248	

Dr. Swarat Chaudhuri		Dr. Kamaldeep		Surya Narayan Prasad	
Dr. Rakesh Raja		Prof. Ritesh Kumar		Prof. Gurpreet Singh	
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