MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

(A Govt. Aided UGC Autonomous & NAAC Accredited Institute Affiliated to RGPV, Bhopal)

Flexible
Scheme & Syllabus
2021-2025

(Admitted Batch- 2021)

B. Tech.

in

Mathematics and Computing

Department of Engineering Mathematics and Computing

Madhav Institute of Technology & Science

Gwalior-474005

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

(A Govt. Aided UGC Autonomous & NAAC Accredited Institute Affiliated to RGPV, Bhopal)

Mathematics and Computing

Abbreviations used

L	**Lecture**
T	**Tutorial**
P	**Practical**
HSMC	**Humanities and Social Sciences including Management Courses**
BSC	**Basic Science Courses**
ESC	**Engineering Science Courses**
DC	**Departmental Core**
DE	**Departmental Elective**
OC	**Open Category**
DLC	**Departmental Laboratory Courses**
MC	**Mandatory Course**
MOOC	**Massive Open Online Courses**

Definition of Credit:

1 Hr. Lecture (L) per week	**1 credit**
1 Hr. Tutorial (T) per week	**1 credit**
2 Hours Practical(Lab)/week	**1 credit**

*****Minor variation is allowed as per need of the respective disciplines. Please consult the AICTE model curriculum as a standard reference, if needed.***

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

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Department of Engineering Mathematics & Computing
Scheme of Examination
B. Tech. (Admitted batch 2021)
I Semester

S.No	Subject Code	Category Code	Subject Name	Maximum Marks Allotted							Total Marks	Contact Hours per week			Total Credits	Mode of Exam	Mode of Teaching
				Theory Slot				Practical Slot									
				End Sem.	$Proficiency in subject /course	Mid Sem Exam.	Quiz/ Assignment	End Sem.	Lab work & Sessional	Skill Based Mini Project		L	T	P			
1.	250101	DC	Introduction to Computing	50	10	20	20	-	-	-	100	3	-	-	3	MCQ	Blended (2/1)
2.	250102	DC	Introduction to Computer Programming	50	10	20	20	60	20	20	200	2	1	2	4	A+O	Blended (2/1)
3.	250107	BSC	Probability and Random Process	50	10	20	20				100	3	1	-	4	PP	Off line
4.	250104	DC	Element of Calculus	50	10	20	20	-	-	-	100	3	1	-	4	PP	Off line
5.	100015	HSMC	Energy, Environment, Ecology & Society	50	10	20	20	-	-	-	100	3	-	-	3	MCQ	On line
6.	250105	DLC	Computing Lab					60	20	20	100			2	1	SO	Off line
Total				**250**	**50**	**100**	**100**	**120**	**40**	**40**	**700**	**14**	**03**	**02**	**19**	-	

MCQ: Multiple Choice Question, **AO:** Assignment + Oral, **OB:** Open Book, **PP:** Pen Paper, **SO:** Submission and Oral

Mode of Teaching						Mode of Examination					Total Credits
Theory				Lab	NEC	Theory			Lab	SIP/ SLP/ NEC	
Offline	Online	Blended		Offline	Interactive	PP	A+O	MCQ	SO	SO	
		Offline	Online								
8	3	4	2	2	-	2	1	2	1	-	19
42%	16%	21%	10.5%	10.5%	-	33.33%	16.66%	33.33%	16.66%	-	Credits %

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

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Department of Engineering Mathematics & Computing
Scheme of Examination
B. Tech. (Admitted batch 2021)
II Semester

S.No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted							Total Marks	Contact Hours per week			Total Credits	Mode Of Exam	Mode of Teaching
					Theory Slot			Practical Slot									
				End Sem.	$Proficiency in subject /course	Mid Sem Exam.	Quiz/ Assignment	End Sem.	Lab work & Sessional	Skill Based Mini Project		L	T	P			
1.	**250201**	DC	Computer Organization and Logic Design	50	10	20	20	-	-	-	100	2	1	-	3	PP	Blended (2/1)
2.	**250202**	DC	Differential Equations	50	10	20	20	-	-	-	100	3	1	-	4	PP	Offline
3.	**250203**	DC	Object Oriented Methodology and Programming with C++	50	10	20	20	60	20	20	200	2	1	2	4	A+O	Blended (3/1)
4.	**250100/ 250204**	BSC	Linear Algebra	50	10	20	20	-	-	-	100	3	1	-	4	PP	Offline
5.	**100016**	HSMC	Technical Language	50	10	20	20				100	2	1	-	3	PP	Blended (2/1)
6.	**100017**	HSMC	Language Lab.					60	20	20	100			2	1	SO	Offline
Total				**250**	**50**	**100**	**100**	**120**	**40**	**40**	**700**	**12**	**05**	**02**	**19**	-	
	$Proficiency in course/subject – includes the weight age towards ability/ skill/ competence /knowledge level /expertise attained /attendance etc. in that particular course/subject																

MCQ: Multiple Choice Question ,**AO:**Assignment + Oral, **OB:**Open Book, **P:** Pen Paper, **SO:** Sessional and Oral

Mode of Teaching						Mode of Examination					Total Credits
Theory				Lab	NEC	Theory			Lab	SIP/ SLP/ NEC	
Offline	Online	Blended		Offline	Interactive	PP	A+O	MCQ	SO	SO	
		Offline	Online								
8	-	6	3	2	-	4	1	-	1	-	19
42.1%	-	31.5%	16%	10.5%	-	66.67%	16.66%	-	16.66%	-	Credits %

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

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Department of Engineering Mathematics & Computing

Scheme of Examination

B. Tech. (Admitted batch 2021)

III Semester

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted							Total Marks	Contact Hours per week			Total Credits	Mode of Teaching (Offline/ Online)	Mode of Exam.
				Theory Slot				Practical Slot				L	T	P			
				End Sem.		Mid Sem. Exam.	Quiz/ Assignment	End Sem	Lab Work & Sessional	Skill Based Mini Project							
				End Term Evaluation	$Proficiency in subject /course												
1.	250301	DC	Simulation Modeling and Analysis	50	10	20	20	-	-	-	100	2	1	-	3	Blended (2/1)	MCQ
2.	250302	BSC	Discrete Mathematical Structures	50	10	20	20	-	-	-	100	3	1	-	4	Offline(4/0)	PP
3.	250303	DC	Operating System Concepts	50	10	20	20	-	-	-	100	2	1	-	3	Blended (2/1)	PP
4.	250304	DC	Data Structures and Algorithms	50	10	20	20	60	20	20	200	3	-	2	4	Blended (2/1)	PP
5.	250305	DC	Numerical Techniques	50	10	20	20	-	-	-	100	3	1	-	4	Offline (4/0)	PP
6.	250306	DLC	Computing Lab	-	-	-	-	60	20	20	100	-	-	2	1	Offline (2/0)	A+O
7.	250307	DLC	Self-learning/ Presentation#	-	-	-	-	-	40	-	40	-	-	2	1	Online +Mentoring	SO
8.	200xxx	CLC	Novel Engaging Course	-	-	-	-	50	-	-	50	-	-	2	1	Interactive	SO
9.	250308	DLC	Summer Internship Project–I (Institute Level Evaluation)	-	-	-	-	60	-	-	60	-	-	4	2	Offline	SO
Total				**250**	**50**	**100**	**100**	**230**	**80**	**40**	**850**	**13**	**4**	**6**	**23**		
10.	1000005	MAC	Project Management and Financing	50	10	20	20	-	-	-	100	2	-	-	Grade	Online	MCQ

$Proficiency in course/subject – includes the weight age towards ability/ skill/ competence /knowledge level /expertise attained /attendance etc. in that particular course/subject
#compulsory registration for one online course using SWAYAM/NPTEL/ MOOC, evaluation through attendance, assignments and presentation

Mode of Teaching						Mode of Examination					Total Credits
Theory				Lab	NEC	Theory			Lab	SIP/ SLP/ NEC	
Offline	Online	Blended		Offline	Interactive	PP	A+O	MCQ	SO	SO	
		Offline	Online								
8	-	6	3	5	1	4	1	2	2	1	23
34.78%	-	26.09%	13.045%	21.74%	4.34%	40%	10%	20%	20%	10%	Credits %

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Department of Engineering Mathematics & Computing

Scheme of Examination

B. Tech. (Admitted batch 2021)

IV Semester

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted							Total Marks	Contact Hours per week			Total Credits	Mode of Teaching (Offline/ Online)	Mode of Exam.
				Theory Slot				Practical Slot				L	T	P			
				End Sem.		Mid Sem. Exam.	Quiz/ Assignment	End Sem	Lab Work & Sessional	Skill Based Mini Project							
				End Term Evaluation	$Proficiency in subject /course												
1.	250401	DC	Transform and Vector Calculus	50	10	20	20	-	-	-	100	2	1	-	3	Offline (3/0)	PP
2.	250402	DC	Data Base and Management System & SQL	50	10	20	20	60	20	20	200	2	1	2	4	Blended (2/1)	PP
3.	250403	DC	Theory of Computation	50	10	20	20				100	2	1	-	3	Blended (2/1)	MCQ
4.	250404	DC	Design & Analysis of Algorithm	50	10	20	20				100	2	1	-	3	Blended(2/1)	PP
5.	250405	DC	Number Theory and Cryptography	50	10	20	20	-	-	-	100	3	1	-	4	Offline(3/0)	PP
6.	250406	DLC	Programming in Python	-	-	-	-	60	20	20	100	-	-	4	2	Offline	SO
7.	200xxx	CLC	Novel Engaging Course	-	-	-	-	50	-		50	-	-	2	1	Interactive	SO
Total				**250**	**50**	**100**	**100**	**170**	**40**	**40**	**750**	**11**	**5**	**4**	**20**		
Summer Internship Project-II (Soft skills Based) for two weeks duration: Evaluation in V Semester																	
8.	1000001	MAC	Indian Constitution and Traditional Knowledge	50	10	20	20	-	-	-	100	2	-	-	Grade	Online	MCQ

$Proficiency in course/subject – includes the weight age towards ability/ skill/ competence /knowledge level /expertise attained /attendance etc. in that particular course/subject

#compulsory registration for one online course using SWAYAM/NPTEL/ MOOC, evaluation through attendance, assignments and presentation

Mode of Teaching						Mode of Examination					Total Credits
Theory				Lab	NEC	Theory			Lab	NEC	
Offline	Online	Blended		Offline	Interactive	PP	A+O	MCQ	SO	SO	
		Offline	Online								
6	2	6	3	2	1	4	-	2	1	1	20
30%	10%	30%	15%	10%	5%	50%	-	25%	12.5%	12.5%	Credits %

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Department of Engineering Mathematics & Computing

Scheme of Examination

B. Tech. (Admitted batch 2021)

V Semester

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted							Total Marks	Contact Hours per week			Total Credits	Mode of Teaching (Offline/ Online)	Mode of Exam.
				Theory Slot				Practical Slot				L	T	P			
				End Sem.		Continuous Evaluation		End Sem.	Continuous Evaluation								
				End Term Evaluation	$Proficiency in subject /course	Mid Sem. Exam	Quiz/ Assignment		Lab Work & Sessional	Skill Based Mini Project							
1.	250501	DC	Computer Networks	50	10	20	20	-	-	-	100	3	-	-	3	Blended (2/1)	PP
2	250502	DC	Real and Complex Analysis	50	10	20	20	-	-		100	3	1	-	4	Offline (4/0)	PP
3	250503	DC	Software Engineering	50	10	20	20				100	3	-	-	3	Blended(2/1)	MCQ
4	250504	MC	Data Science using Python	50	10	20	20	60	20	20	200	2	1	2	4	Blended (2/1)	MCQ
5	250505	DC	Optimization Techniques	50	10	20	20	-	-	-	100	3	1	-	4	Offline (4/0)	PP
6	250506	DLC	Minor Project-I	-	-	-	-	60	40	-	100	-	-	4	2	Offline (2/0)	SO
7	250507	DLC	Self-learning/Presentation# (NPTEL/SWAYAM/MOOC)	-	-	-	-	-	40	-	40	-	-	2	1	Online mentoring	SO
8	200xxx	CLC	Novel Engaging Course (Informal Learning)	-	-	-	-	50	-	-	50	-		2	1	Interactive	SO
9	250508	DLC	Summer Internship Project -II	-	-	-	-	60	-		60	-	-	4	2	Offline	SO
Total				**250**	**50**	**100**	**100**	**230**	**100**	**20**	**850**	**14**	**3**	**7**	**24**		
10	1000006	MAC	Disaster Management	50	10	20	20	-	-	-	100	2	-	-	Grade	Online	MCQ

$**proficiency in course/subject-includes the weightage towards ability/skill/competence/knowledge level/ expertise attained etc. in that particular course/subject.**

$$**MCQ:** Multiple Choice Question $$**AO:** Assignment + Oral $$**PP:** Pen Paper $$**SO:** Submission + Oral

*** **The Minor Project-I may be evaluated by an internal committee for awarding sessional marks.**

Compulsory registration for one online course using SWAYAM/NPTEL/MOOC, evaluation through attendance, assignments and presentation

Mode of Teaching						Mode of Examination					Total Credits
Theory				Lab	NEC	Theory			Lab	NEC	
Offline	Online	Blended		Offline	Interactive	PP	A+O	MCQ	SO	SO	
		Offline	Online								
8	-	6	3	6	1	3	-	2	3	1	24
33.337%	-	25%	12.5%	25%	4.17%	30%	-	30%	30%	10%	

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

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Scheme of Examination

B.Tech. Offered by Department of Engineering Mathematics & Computing

VI Semester (Admitted batch 2021)

S. No.	ubject Code	Category Code	Subject Name	Maximum Marks Allotted									Total Marks	Contact Hours per week		Total Credits		Mode of Teaching (Offline/ Online)	Mode of Exam.
				Theory Slot				Practical Slot			MOOCs								
				End Sem.		Mid Sem. Exam.	Quiz/ Assignment	End Sem	Lab Work & Sessional	Skill Based Mini Project	Assignment	Exam		L	T	P			
				End Term Evaluation	$Proficiency in subject /course														
1.	250601	DC	Computer Graphics	50	10	20	20	-	-	-			100	3	1	-	4	Offline	PP
2.	250602	DC	Compiler Design	50	10	20	20	-	-	-			100	3	1	-	4	Offline	PP
3.	250603	DE	Departmental Elective (DE-I)								25	75	100	3	-	-	3	Online	MCQ
4	250604	MC	Artificial Intelligence & Machine Learning (AI & ML)	50	10	20	20	60	20	20			200	3	-	2	4	Blended	MCQ
5.		OC	Open Category (OC-1)	50	10	20	20	-	-	-			100	3	-	-	3	Offline	PP/MCQ
6.	250605	DLC	Minor Project-II	50	10	20	20						100	-	-	4	2	Offline (2/0)	SO
7.	200xxx	CLC	Novel Engaging Course	-	-	-	-	50	-	-			50	-	-	2	1	Interactive	SO
Total				250	50	100	100	110	20	20	25	75	750	15	2	4	21		
Summer Internship-III (On Job Training) for Four weeks duration: Evaluation in VII Semester																			
8.	MAC		Intellectual Property Right (IPR)	50	10	20	20	-					100	2			GRADE	Online	MCQ

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$$MCQ: Multiple Choice Question $$AO: Assignment + Oral $$PP: Pen Paper $$SO: Submission + Oral

** The Minor Project-I may be evaluated by an internal committee for awarding sessional marks.

Compulsory registration for one online course using SWAYAM/NPTEL/MOOC, evaluation through attendance, assignments and presentation

Mode of Teaching						Mode of Examination					Total Credits
Theory				Lab	NEC	Theory			Lab	NEC	
Offline	Online	Blended		Offline	Interactive	PP	A+O	MCQ	SO	SO	
		Offline	Online								
11	3	3	1	2	1	3		3	1	1	
52.38%	14.28%	14.28%	4.76%	9.52%	4.76%	37.5%		37.5%	12.5%	12.5%	

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Open Course (OC- I)		
S. No.	**Subject Code**	**Subject name**
1		Advanced Numerical Techniques
2		Transform Calculus
3		Computational Fluid Dynamics

DE –I (Through NPTEL)					
S. No.	**Subject Code**	**Subject name**	**Time Duration (Weeks)**	**Faculty Coordinator**	**Mentor Name and Affiliation**
1	250605	Block chain and its application	12	*Dr. MinakshiDhaiya*	*Prof. SandipChakraborty, Prof. ShamikSural from IIT Kharagpur*
2	250606	Cloud Computing	12		*Prof. SoumyaKantiGhosh from IIT Kharagpur*
3	250607	GPU Architectures and Programming	12		*Prof. SoumyajitDey from IIT Kharagpur*

Minor Specialization					
S. No.	**Subject Code**	**Subject name**	**Time Duration (Weeks)**	**Faculty Coordinator**	**Mentor Name and Affiliation**
1		A Primer to Mathematical Optimization	12	*Dr. MinakshiDhaiya*	*Prof. DebdasGhosh from IIT (BHU), Varanasi*
2		Advanced Linear Algebra	12		*Prof. PremanandaBera from IIT Roorkee*
3		Advanced Probability Theory	12		*Prof. NiladriChatterjee from IIT Delhi*

Honors Specialization					
S. No.	**Subject Code**	**Subject name**	**Time Duration (Weeks)**	**Faculty Coordinator**	**Mentor Name and Affiliation**
1		Getting Started with Competitive Programming	12	*Dr. MinakshiDhaiya*	*Prof. NeeldharaMisra from IIT Gandhinagar*
2		Advanced Graph Theory	8		*Prof. Rajiv Misra from IIT Patna*
3		Computer Vision & Image Processing Fundamental and Applications	12		*Prof. M. K. Bhuyan from IIT Guwahati*

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

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Scheme of Examination

B.Tech. Offered by Department of Engineering Mathematics & Computing

VII Semester

For batches admitted in academic session 2021-22

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted									Total Marks	Contact Hours per week			Total Credits	Mode of Teaching (Online, Offline, Blended)	$^{\$\$}$Mode of Exam.
				Theory Slot				Practical Slot			MOOCs			L	T	P			
				End Term Evaluation		Continuous Evaluation		End Sem. Exam.	Continuous Evaluation		Assignment	Exam							
				End Sem. Exam.	$^{\$}$Proficiency in subject /course	Mid Sem. Exam	Quiz/ Assignment		Lab work & Sessional	Skill Based Mini Project									
1.	250701	DE	Departmental Elective* (DE-II)	50	10	20	20	-	-	-	-	-	100	3	-	-	3		
2.	250702	DE	Departmental Elective* (DE-III)	-	-	-	-	-	-	-	25	75	100	3	-	-	3		
3.		OC	Open Category (OC-2)	50	10	20	20	-	-	-	-	-	100	3	-	-	3		
4.		OC	Open Category (OC-3)	50	10	20	20	-	-	-	-	-	100	3	-	-	3		
5.	250703	DLC	Departmental Lab	-	-	-	-	60	20	20	-	-	100	-	-	4	2		
6.	250704	DLC	Creative Problem Solving (Evaluation)	-	-	-	-	25	25	-	-	-	50	-	-	2	1		
7.	250705	DLC	Summer Internship Project-III (04 weeks) (Evaluation)	-	-	-	-	60	-	-	-	-	60	-	-	4	2		
Total				**100**	**20**	**40**	**40**	**145**	**45**	**20**	**50**	**150**	**610**	**12**	**-**	**10**	**17**	**-**	**-**
8		MAC	Universal Human Values & Professional Ethics(UHVPE)	50	10	20	20	-	-	-	-	-	100	2	-	-	GRADE	Online	MCQ
Additional Course for Honours or minor Specialization				**Permitted to opt for maximum two additional courses for the award of Honours or Minor specialization**															

$ proficiency in course/subject-includes the weightage towards ability/skill/competence/knowledge level/ expertise attained etc. in that particular course/subject.

$^{\$\$}$**MCQ:** Multiple Choice Question $^{\$\$}$**AO:** Assignment + Oral $^{\$\$}$**PP:** Pen Paper $^{\$\$}$**SO:** Submission + Oral

*** Course run through SWAYAM/NPTEL/ MOOC Learning Based Platform with Credit Transfer**

Mode of Teaching						Mode of Examination					Total Credits
Theory				Lab	NEC	Theory			Lab	NEC	
Offline	Online	Blended		Offline	Interactive	PP	A+O	MCQ	SO	SO	
		Offline	Online								

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

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Scheme of Examination

B.Tech. Offered by Department of Engineering Mathematics & Computing

VIII Semester

For batches admitted in academic session 2021-22

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted									Total Marks	Contact Hours per week			Total Credits	Mode of Teaching (Online, Offline, Blended)	Mode of Exam.
				Theory Slot				Practical Slot			MOOCs			L	T	P			
				End Term Evaluation		Continuous Evaluation		End Sem. Exam.	Continuous Evaluation		Assignment	Exam							
				End Sem. Exam.	$Proficiency in subject /course	Mid Sem. Exam	Quiz/ Assignment		Lab work & Sessional	Skill Based Mini Project									
1.	250801	DE	Departmental Elective* (DE-IV)	-	-	-	-	-	-	-	25	75	100	3	-	-	3		
2.		OC	Open Category* (OC-IV)	-	-	-	-	-	-	-	25	75	100	3	-	-	3		
3.	250802	DLC	Internship/Project	-	-	-	-	250	150	-	-	-	400	-	-	18	9		
4.		-	Professional Development #	-	-	-	-	50	-	-	-	-	50	-	-	4	2		
Total				-	-	-	-	**300**	**150**	-	**50**	**150**	**650**	**6**	-	**22**	**17**	-	-
Additional Course for Honours or minor Specialization				**Permitted to opt for maximum two additional courses for the award of Honours or Minor specialization**															

$ proficiency in course/subject-includes the weightage towards ability/skill/competence/knowledge level/ expertise attained etc. in that particular course/subject.

MCQ: Multiple Choice Question **AO:** Assignment + Oral **PP:** Pen Paper **SO:** Submission + Oral

*All of these courses will run through SWAYAM/NPTEL/ MOOC with credit transfer

#Evaluation will be based on participation/laurels brought by the students to the institution in national/state level technical and other events during the complete tenure of the UG programme (participation in professional chapter activities, club activities, cultural events, sports, personality development activities, collaborative events, MOOCs, technical events, institute/department committees, etc.)

Mode of Teaching						Mode of Examination					Total Credits
Theory				Lab	NEC	Theory			Lab	NEC	
Offline	Online	Blended		Offline	Interactive	PP	A+O	MCQ	SO	SO	
		Offline	Online								

$$ ***The mode of exam of a course is based on the following:***

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

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Nature of Subject/Course	Theory/ Practical	Learning Levels	Preferable Mode of Examination
Theoretical	Theory	Remembering, Understanding, Applying	MCQ Based
Computational/ Mathematical	Theory	Applying, Analysing	Pen Paper
Design / Drawing / Programming	Theory	Applying, Analysing, Evaluating, Creating	Assignment + Oral
Practical (Programming/ Knowledge/ Application)	Practical	Understanding, Applying	Submission+ Oral
Practical (Design/Analysis)	Practical	Analysing, Evaluating	Assignment + Oral
Projects	Practical	Creating, Evaluating, Analyzing	Submission+ Oral
MOOCs	Theory	As decided by the course mentor	Assignment + Proctored Examination

Department of Engineering Mathematics and Computing

B. Tech. (First Semester)

Introduction to Computing
(MAC-250101)

L	T	P	C
3	0	0	3

Course Objectives:

- Demonstrate the use of mathematical software and solve simple mathematical problems.
- Explain the needs of hardware and software required for a computation task.
- State typical provisions of cyber law that govern the proper usage of Internet and computing resources.
- Explain the working of important application software and their use to perform any engineering activity.
- Demonstrate the use of Operating system commands and shell script

Unit 1:

Computer: Definition, Classification, Organization i.e. CPU, register, Instruction set, Memory & Storage Systems, I/O Devices, and System & Application Software. Operating System: Definition, Function, Types, Management of File, Process & Memory, Introduction to Assemblers, Interpreters, Compilers and Debuggers.

Unit 2:

Computer Networking: Introduction, Introduction to Internet, World Wide Web, E-commerce Computer Security Basics: Introduction to viruses, worms, malware, Trojans, Spyware and Anti-Spyware Software, Different types of attacks like Money Laundering, Information Theft, Email spoofing, Hacking Spamming, Cyber Defamation, pharming Security measures Firewall, Computer Ethics & Good Practices

Unit 3:

Data base Management System: Introduction, File oriented approach and Database approach, Data Models, Architecture of Database System, Data independence, Data dictionary, DBA, Primary Key, Data definition language and Manipulation Languages.

Unit 4:

A brief history of LINUX, architecture of LINUX, features of LINUX, introduction to vi editor. Linux commands-PATH, man, echo, printf, script, passwd, uname, who, date, stty, pwd, cd, mkdir, rmdir, ls, cp, mv, rm, cat, more, wc, lp, od, tar, gzip, file handling utilities, security by file permissions, process utilities, disk utilities, networking commands, unlink, du, df, mount, umount, find, unmask, ulimit, ps, w, finger, arp, ftp, telnet, rlogin.Text Processing utilities and backup utilities , tail, head , sort, nl, uniq, grep, egrep, fgrep, cut, paste, join, tee, pg, comm, cmp, diff, tr, awk, cpio

Unit 5:

Career opportunities Entrepreneurship, Start up: Scope, Funding Opportunities, Other career opportunities; Case Studies Success stories of Google, Facebook, Walmart, Uber etc. in socio-economic progress.

Course Outcomes

After completing this course, the students will be able to:

CO's	Description of CO's
CO1	Explain core components of computing and linking
CO2	Explaining ideas of networking aspect of computer engineering and communication
CO3	Apply knowledge of database system
CO4	Summarizing role of operating system
CO5	Implementing the role of computing in real world applications

RECOMMENDED BOOKS:

1. J. Glenn Brookshear, and Dennis Brylow: Computer Science: An Overview, Pearson, 2010
2. V. Rajaraman, Neeharika and A Dabala: Fundamentals of Computers, PHI, 2011
3. Peter Norton, Introduction to Computers:McGraw Hill Education, 2nd , 2012
4. PradeepSinha: Introduction to Computer Science: A Textbook for Beginners in Informatics, BPB Publication, 6th Edition, 2015
5. Patt Yale: Introduction to Computing Systems,McGraw Hill Education Ind=ia, 2nd, 2014

Introduction to Computer Programming
(MAC – 250102)

L	T	P	C
3	0	2	4

Course Objective:

- Develop ability to write a computer program to solve specified problems.
- Develop skills in algorithmic problem-solving, expressed in a programming language like C.
- Learn what computer science is about, especially hardware, data representations, algorithms, encodings, form of programming.
- Understand fundamentals of programming such as variables, conditional and iterative statement, function and its execution etc.

Unit 1:

Introduction to Programming, Machine Level Languages, Assembly Level Languages, High Level Languages, Program Execution and Translation Process, Problem solving using Algorithms and Flowcharts. Introduction to Programming: Data Types, Constants, Keywords, Operators & Expressions, Precedence of operators and input/output functions.

Unit 2:

Control Statements and Decision Making: The go to statement, The if statement, The if-else statement, Nesting of if statements, The conditional expression, The switch statement, The while loop, The do…while loop, The for loop, The nesting of for loops, The break and continue statement.

Unit 3:

Arrays, Strings & Pointers: One dimensional Arrays, Passing Arrays to Functions, Multidimensional Arrays, Strings, Basics of Pointers & Addresses, Pointer to Pointer, Pointer to Array, Array of Pointers, Types of pointers, Pointer to Strings.

Unit 4:

Functions & Structures: Function Basics, Function Prototypes, Passing Parameter by value and by reference, Passing string to function, Passing array to function, Function returning address, Recursion, Structures & Union, Pointer to Structure, Self-Referential Structures, Dynamic memory allocation by call of function, Storage Classes.

Unit 5:

File Handling: Defining and Opening a file, Closing Files, Input/output Operations on Files, Predefined Streams, Error Handling during I/O Operations, Command Line Arguments, Pre-processor, Directives, Formatted I/O.

Course Outcomes

CO's	Description of CO's
CO1	Recognizing the concept of programming Languages.
CO2	Testing the principles of imperative and structural programming.
CO3	Apply the concept of Arrays and Pointer in programming
CO4	Illustrate the problems and choose suitable programming techniques to develop solutions
CO5	Implementing input/ output operations and basic commands

Reference Books

1. E. Balagurusamy: Programming in ANSI C, Tata McGraw Hill,Sevenths Edition, 2017.
2. ReemaThareja: Programming in C, Oxford publication, Second Edition , 2016.
3. W. Kernighan and Dennis M. Ritchie: The C Programming Language, Pearson , 2015.
4. Matthias Felleisen, Robert BruceFindler , Mathew Flatt, ShriramKrishnamurthi: How to Design Programs: An Introduction to Programming and Computing, MIT Press,Second Edition, 2018.
5. E. Balagurusamy: Object Oriented Programming with C++, Tata McGraw Hill, 2009.
6. B.S. Gottfried: Programming with C, Tata McGraw Hill,3rd Edition, 2018.

Department of Engineering Mathematics and Computing

B. Tech. (First Semester)
Probability and Random Process
(MAC – 250107)

Course Objective

- To have knowledge of Central Tendency & Skewness, Kurtosis.
- To describe probability theory and distribution
- To familiarize Correlation and Regression
- To know about the Hypothesis analysis
- To explore the theory of attributes and rules of association

L	T	P	C
3	1	0	4

Unit 1:
Definition–Classical and axiomatic approaches, Laws of total and compound probability, conditional probability, Bayes Theorem., Probability distribution function, Probability density function, Different modes of convergence laws of large numbers, central limit theorem, discrete and continuous probability distributions, some special distributions

Unit 2:
Measures of averages and Standard deviation, moments, moment generating function, Skewness and kurtosis, Curve fitting, correlation and regression.

Unit 3:
Testing of Hypothesis, Basic concept of estimation, Concept of the theory of sampling, chi-square (χ^2) distribution, t-distribution, Fisher's Z-distribution, Analysis of Variance

Unit 4:
Concept of Random variable, one dimensional Random variable, two dimensional Random variable, distribution function, Joint probability distribution function, Marginal probability distribution, cumulative probability distribution, conditional distribution function.

Unit 5:
Random process, classification of random process, stationary process, Ergodic process, Markov process, Poisson process, Markov chain, classification of states, matrix transition probabilities, n-step transition probabilities.

Course Outcomes
After completing this course, the students will be able to:

CO's	Description of CO's
CO1	Interpreting the theory of Probability and its distributions
CO2	Evaluating the Skewness, Kurtosis, curve fitting, correlation and regression.
CO3	Applying the various test to validate the hypothesis
CO4	Explaining the knowledge of random variables.
CO5	Judging the various random process

Recommended Books:

1. M Ray and H.S. Sharma: Mathematical Statistics, Ram Prasad Publications, 3rd Edition 2017.
2. V. K. Kapoor, S.C. Gupta: Statistical Methods, S. Chand& Company, 11th Edition 2018.
3. T. Veerarajan: Probability, Statistics and Random Processes, McGraw Hill, 3rd Edition 2008.
4. S. M. Rose: Introduction to Probability Models, Elsevier, 10th Edition 2011.

Department of Engineering Mathematics and Computing

B. Tech. (First Semester)

Elements of Calculus

(MAC-250104)

L	T	P	C
3	1	0	4

Objective of Course

- To understand the basic concepts of differential calculus
- To explore the applications of derivatives
- To familiarize the integral calculus
- To describe multiple integral
- To understand the concepts of Convergence and divergence

Unit 1:
Maclaurins's and Taylor's theorem, Partial differentiation, Euler's theorem, Tangent and Normal, Maxima and Minima of one and two variables.

Unit 2:
Jacobian, Rolle 's Theorem, First mean value theorem, Second mean value theorem, Curvature, radius of curvature, Asymptotes of Cartesian and Polar forms.

Unit 3:
Definite integral as limit of a sum, application in summation of series, Improper integral, Beta and Gamma function and its properties, some transformation of Beta function, some transformations of Gama function, relation between Beta and Gama function, Legendre's duplication formula.

Unit 4:
Multiple integral and their applications, Double and Triple integral, Change of order of integration, Length of the curves, Volumes and Surfaces of solids of revolution.

Unit 5:
Concept of convergence and divergence, Basic test of convergence for sequence and series, P-Series test, Ratio test, Comparison test, Integral test, Cauchy's root test, Test of convergence and divergence of improper integral.

Course Outcomes
After completing this course, the students will be able to:

CO's	Description of CO's
CO1	Applying various theorems to expand the functions of one and two variables.
CO2	Demonstrate the application of derivatives
CO3	Examine the various integrals
CO4	Evaluate the volume and area of surface by using multiple integrals
CO5	Summarising the various convergence test

Recommended Books:

1. E. Kreyszig: Advance Engineering Mathematics, John Wiley & Sons, 10th Edition (2011).
2. R. K. Jain, S. R. K. Iyengar: Advance Engineering Mathematics,Narosa Publishing House Pvt.Ltd, 5th Edition (2016).
3. F. B. Hildebrand: Advanced Calculus for application, Englewood Cliffs, N. J. Prentice- Hall, 2nd Edition (1980).
4. B. S. Grewal: Higher Engineering Mathematics, Khanna Publishers, 43rd Edition (2015).
5. B.V. Ramanna: Higher Engineering Mathematics, McGraw Hill, 1st Edition (2017).

Bachelor of Technology Grading Scheme 2020-2021 SESSION (Flexible Curriculum) [Applicable to B. Tech.]					
S. No.	**Subject Code**	**Subject Name**	**L**	**T**	**P**	**C**
1	**100016/100103**	**Technical English/Communication**	**3**	**0**	**0**	**3**

S. No.	Subject Code	Subject Name	Maximum Marks Allotted					Total Marks	Contacts / week			Total Credits
			Theory Block			Practical Block						
			End Sem	Mid Sem	Quiz/Assignment	End Sem	Lab Work /Sessional		L	T	P	
2	**100103**	**Technical English**	**60**	**20**	**20**	**-**	**-**	**100**	**3**	**0**	**0**	**3**

Course Objectives:

- The course intends to build the required communication skills of the students so as to communicate effectively in real-life situations like starting a talk and be comfortable using English language.
- It aims at teaching students to appreciate English language through the study of scientific, creative, and academic text.
- The course is designed to acquaint students with structure of English language used in literature, functional varieties, figurative language, and verbal concomitance.
- The students are expected to enrich their knowledge of language, culture, and ethics through this course.

Unit I: Introduction to Language & Linguistics [CO1, CO2,]
An Introduction to Linguistics, IPA, English Phonetic Symbols/Sign & Sounds, Place & Manner of Articulation.

Unit II: Communication [CO1, CO2, CO4, CO6]
Communication: Approaches, Elements, Types, Process, Models; Management Communication (Levels of Communication) and Grapevine Communication, Verbal and Nonverbal Communication; Barriers to Communication; Johari Communication Window.

Unit III: Application of Linguistic Ability [CO1, CO2, CO4, CO6]
1. Listening: Factors Affecting Listening and Improving Listening.
2. Speaking: Making Speeches, Presentation, Group Discussion, Meeting, Interview, Debate.

Unit IV: Grammar & Vocabulary: [CO3, CO5]
Grammar: Parts of Speech, Subject-verb Agreement, Active and Passive Voice, conditional sentences.
Vocabulary: Using the dictionary and thesaurus, word formation, prefix & suffix, idioms, phrasal verbs.

Unit V: Report Writing: [CO3, CO5]
Reading Comprehension: Stories, Passages, Poetry and Scientific Text
Writing: Essentials of good writing, Technical Descriptions of Simple Engineering Objects; Formal (Application, Email, CV, Résumé, Memo, Report writing)

*****Material for story and poetry is to be selected by concerned teacher in class.

Reference Books: -

- *Technical Communication — By Meenakshi Raman, OUP.*
- *Understanding Human Communication — By Ronald Alderman by OUP*
- *Communication Skills for Engineers — Pearson Education.*
- *Practical English Grammar by Thomson Martinet — Oxford University Press*
- *A Handbook of Language laboratory by P SreeKumar — Cambridge University Press.*

Course Outcomes: After successful completion of the course the student will be able to:

CO1 → Speak clearly effectively and appropriately in a public forum to a variety of audiences and purposes. (LOT1)
CO2 → Prepare oral presentations and arguments within the Engineering Profession effectively. (LOT2)
CO3 → Demonstrate knowledge and comprehension of major text and traditions in language as well as its social, cultural, and historical context. (LOT3)
CO4 → Read a variety of Text analytically so as to demonstrate in writing and/or speech the interpretation of texts. (HOT4)
CO5 → Interpret text written in English assessing the results in written and oral arguments using appropriate material for support. (LOT3)

S. No.	Subject Code	Subject Name	L	T	P	C
1	100017	Language Lab	0	0	2	1

S.No.	Subject Code	Subject Name	Maximum Marks Allotted					Total Marks	Contacts / week			Total Credits
			Theory Block			Practical Block						
			End Sem	Mid Sem	Quiz/Assignment	End Sem	Lab Work /Sessional		L	T	P	
2	100017	Language Laboratory	-	-	-	60	40	100	0	0	2	1

Objective:

- The course intends to build the required communication skills of the students.
- The course seeks to facilitate the use of English Language in daily discourse.
- Students will develop command their listening and speaking habit.
- Students will groom their personality proper application of behavioural skills.

Course Content:

Language Laboratory: The objective of the language lab is to expose students to a variety of listening and speaking drills. This would especially benefit students who are deficient in English and it also aims at confidence building for interviews and competitive examinations. The Lab is to cover following syllabus.

1. Communication lab exercises as specified in Lab Manual
2. Listening skills using Marc Hancock.
3. Speaking skills. (A) Phonetic symbols, pronunciation.
   (B). Conversation: telephonic, face to face, formal and informal situations
4. Oral presentation.

Laboratory Part:

- Debate (08 Lectures)
- Extempore and Just a Minute Sessions (06 lectures)
- Listening (06 Lectures)
- Reading Comprehension (06 Lectures)
- Exercises as prescribed in Lab Manual (16 Lectures)

Reference Books:

- Intermediate English Grammar by Murphy, Raymond. — Cambridge University Press
- English Vocabulary in Use by McCarthy, Michael & Felicity O' Dell — Cambridge University Press
- Modern English Usage by M. Fowler — OUP

Course Outcomes: After successful completion of the course the student will be able to:

CO1 → Speak clearly effectively and appropriately in a public forum to a variety of audiences and purposes. (LOT1)

CO2 → Deliver effectively oral presentations. (LOT3)

CO3 → Grasp knowledge and comprehensive skills to speak on a given topic on spot. (LOT2)

CO4 → Interpret English spoken by others and respond to situation. (LOT3)

CO5 → Analyse English Language as spoken by others in day to day life. (HOT4)

Department of Engineering Mathematics & Computing

B. Tech. (First Semester)

Programming and Problem Solving (250102)

Experiment List

1. C "Hello, World!" Program
2. C Program to Print an Integer (Entered by the User)
3. C Program to Add Two Integers
4. C Program to Multiply Two Floating-Point Numbers
5. C Program to Find ASCII Value of a Character
6. C Program to Compute Quotient and Remainder
7. C Program to Find the Size of int, float, double and char
8. C Program to Demonstrate the Working of Keyword long
9. C Program to Swap Two Numbers
10. C Program to Check Whether a Number is Even or Odd
11. C Program to Check Whether a Character is a Vowel or Consonant
12. C Program to Find the Largest Number Among Three Numbers
13. C Program to Find the Roots of a Quadratic Equation
14. C Program to Check Leap Year
15. C Program to Check Whether a Number is Positive or Negative
16. C Program to Check Whether a Character is an Alphabet or not
17. C Program to Calculate the Sum of Natural Numbers
18. C Program to Find Factorial of a Number
19. C Program to Generate Multiplication Table
20. C Program to Display Fibonacci Sequence
21. C Program to Find GCD of two Numbers
22. C Program to Find LCM of two Numbers
23. C Program to Display Characters from A to Z Using Loop
24. C Program to Count Number of Digits in an Integer
25. C Program to Reverse a Number
26. C Program to Calculate the Power of a Number
27. C Program to Check Whether a Number is Palindrome or Not
28. C Program to Check Whether a Number is Prime or Not
29. C Program to Display Prime Numbers Between Two Intervals
30. C Program to Check Armstrong Number
31. C Program to Display Armstrong Number Between Two Intervals
32. C Program to Display Factors of a Number
33. C Program to Make a Simple Calculator Using switch...case
34. C Program to Display Prime Numbers Between Intervals Using Function
35. C Program to Check Prime or Armstrong Number Using User-defined Function
36. C Program to Check Whether a Number can be Expressed as Sum of Two Prime Numbers
37. C Program to Find the Sum of Natural Numbers using Recursion
38. C Program to Find Factorial of a Number Using Recursion
39. C Program to Find G.C.D Using Recursion
40. C Program to Convert Binary Number to Decimal and vice-versa
41. C Program to Convert Octal Number to Decimal and vice-versa
42. C Program to Convert Binary Number to Octal and vice-versa

43. C Program to Reverse a Sentence Using Recursion
44. C program to calculate the power using recursion
45. C Program to Calculate Average Using Arrays
46. C Program to Find Largest Element in an Array
47. C Program to Calculate Standard Deviation
48. C Program to Add Two Matrices Using Multi-dimensional Arrays
49. C Program to Multiply Two Matrices Using Multi-dimensional Arrays
50. C Program to Find Transpose of a Matrix
51. C Program to Multiply two Matrices by Passing Matrix to a Function
52. C Program to Access Array Elements Using Pointer
53. C Program Swap Numbers in Cyclic Order Using Call by Reference
54. C Program to Find Largest Number Using Dynamic Memory Allocation
55. C Program to Find the Frequency of Characters in a String
56. C Program to Count the Number of Vowels, Consonants and so on
57. C Program to Remove all Characters in a String Except Alphabets
58. C Program to Find the Length of a String
59. C Program to Concatenate Two Strings
60. C Program to Copy String Without Using strcpy()
61. C Program to Sort Elements in Lexicographical Order (Dictionary Order)
62. C Program to Store Information of a Student Using Structure
63. C Program to Add Two Distances (in inch-feet system) using Structures
64. C Program to Add Two Complex Numbers by Passing Structure to a Function
65. C Program to Calculate Difference Between Two Time Periods
66. C Program to Store Information of Students Using Structure
67. C Program to Store Data in Structures Dynamically
68. C Program to Write a Sentence to a File
69. C Program to Read the First Line From a File
70. C Program to Display its own Source Code as Output
71. C Program to Print Pyramids and Patterns

Skill Based Mini Projects

1. The mouse pointer can be restricted in particular rectangle. The idea is to create a function called **restrictmouse()** which takes four parameters which containing X coordinate and Y coordinate. First point mention the top of the rectangle and the second point mention the bottom of the rectangle. Below are the functions used for the same:

- **initmouse():** use to initialize mouse.
- **showmouse():** shows the mouse pointer on the output screen.
- **restrictmouse():** used to set Horizontal and vertical limit of the mouse pointer by setting the following parameters. **AX = 7** for horizontal and **AX = 8** for vertical.

2. This following program makes use of some sub function, which were already discussed previously, and shows how they can be used to write useful programs like free-hand drawing. Below are the functions used:

- **initmouse():** use to initialize mouse.
- **showmouse():** shows mouse pointer on the output screen.
- **hidemouse():** used to hide mouse while drawing.
- **getmouseposition():** Fetches current location of the pointer and draw line accordingly.

3. (The Sieve of Eratosthenes) A prime integer is any integer greater than 1 that can be divided evenly only by itself and 1. The Sieve of Eratosthenes is a method of finding prime numbers. It works as follows:
a) Create an array with all elements initialized to 1 (true). Array elements with prime subscripts will remain 1. All other array elements will eventually be set to zero.

b) Starting with array subscript 2 (subscript 1 is not prime), every time an array element is found whose value is 1, loop through the remainder of the array and set to zero every element whose subscript is a multiple of the subscript for the element with value 1. For array subscript 2, all elements beyond 2 in the array that are multiples of 2 will be set to zero (subscripts 4, 6, 8, 10, and so on.). For array subscript 3, all elements beyond 3 in the array that are multiples of 3 will be set to zero (subscripts 6, 9, 12, 15, and so on.). When this process is complete, the array elements that are still set to 1 indicate that the subscript is a prime number. Write a program that uses an array of 1000 elements to determine and print the prime numbers between 1 and 999. Ignore element 0 of the array.

4. (Airline Reservations System) A small airline has just purchased a computer for its new automated reservations system. The president has asked you to program the new system. You'll write a program to assign seats on each flight of the airline's only plane (capacity: 10 seats). Your program should display the following menu of alternatives:

Please type 1 for "first class"
Please type 2 for "economy"

If the person types 1, then your program should assign a seat in the first class section (seats 1–5). If the person types 2, then your program should assign a seat in the economy section (seats 6–10). Your program should then print a boarding pass indicating the person's seat number and whether it's in the first class or economy section of the plane.

Use a single-subscripted array to represent the seating chart of the plane. Initialize all the elements of the array to 0 to indicate that all seats are empty. As each seat is assigned, set the corresponding element of the array to 1 to indicate that the seat is no longer available.

Your program should, of course, never assign a seat that has already been assigned. When the first class section is full, your program should ask the person if it's acceptable to be placed in the economy section (and vice versa). If yes, then make the appropriate seat assignment. If no, then print the message "Next flight leaves in 3 hours."

5. (Total Sales) Use a double-subscripted array to solve the following problem. A company as four salespeople (1 to 4) who sell five different products (1 to 5). Once a day, each salesperson passes in a slip for each different type of product sold. Each slip contains:

a) The salesperson number
b) The product number
c) The total dollar value of that product sold that day

Thus, each salesperson passes in between 0 and 5 sales slips per day. Assume that the information from all of the slips for last month is available. Write a program that will read all this information for last month's sales and summarize the total sales by salesperson by product. All totals should be stored in the double-subscripted array sales. After processing all the information for last month, print the results in tabular format with each of the columns representing a particular salesperson and each of the rows representing a particular product. Cross total each row to get the total sales of each product for last month; cross total each column to get the total sales by salesperson for last month. Your tabular printout should include these cross totals to the right of the totaled rows and to the bottom of the totaled columns.

STATISTICAL DATA ANALYSIS USING EXCEL AND SPSS
Computing Lab (250105)

Topics Cover in Experiments

Unit 1:

Introduction to MS Excel - MS Excel Options — Ribbon - Sheets - Saving Excel File as PDF, CSV and Older versions - Using Excel Shortcuts - Copy, Cut, Paste, Hide, Unhide, and Link the Data in Rows, Columns and Sheet - Using Paste Special Options - Formatting Cells, Rows, Columns and Sheets - Protecting & Unprotecting Cells, Rows, Columns and Sheets with or without Password - Page Layout and Printer Properties.

Unit 2

Functions: - Logical Functions - Date and Time Functions - Information Functions -Math and Trigonometry Functions - Statistical Functions - Text Functions - Charts:- Simple Bar Chart — Multiple Bar Chart — Subdivided Bar Chart — Pie Chart — Donut Chart - Line Chart — Histogram — Scatter Plot - Radar Chart — Bubble Chart — Bi-Axis chart — Plotting Density Function and Distribution Function.

Vlookup, Hlookup, Index, Address, Match, Offset, Transpose - Conditional Formatting - Data Sorting and Filtering -Pivot Tables - Chart Templates — Adding Add-Ins in Excel - Solver — Goal Seek.

Unit 3:

Data handling: open SPSS data file — save — import from other data source — data entry — labeling for dummy numbers - recode in to same variable — recode in to different variable — transpose of data —insert variables and cases — merge variables and cases.

Unit 4:

Data handling: Split — select cases — compute total scores — table looks — Changing column - font style and sizes. Diagrammatic representation: Simple Bar diagram — Multiple bar diagram — Sub-divided Bar diagram -Percentage diagram - Pie Diagram — Frequency Table — Histogram — Scatter diagram — Box plot.

Unit 5:

Application to excel and Spss for Descriptive Statistics - Mean, Median, Mode, SD- Skewness- Kurtosis. Correlation — Karl Pearson's and Spearman's Rank Correlation , Regression analysis: Simple and Multiple Regression Analysis [Enter and stepwise methods]

List of Experiments

1. Lab 1 Frequency Distributions and Graphs
2. Lab 2 Data Description
3. Lab 3 Probability and Counting Rules
4. Lab 4 Discrete Probability Distributions
5. Lab 5 The Normal Distribution
6. Lab 6 Confidence Intervals
7. Lab 7 Hypothesis Testing
8. Lab 8 Testing the Difference Between Parameters from Two Populations
9. Lab 9 Correlation and Regression
10. Lab 10 Tests for Categorical Variables
11. Lab 11 One-Way Analysis of Variance (ANOVA)
12. Lab 12 Stem-and-Leaf Plots and Frequency Tables
13. Lab 13 Summary Statistics USING SPSS.
14. Lab 14 To calculate and interpret binomial and normal probabilities.
15. Lab 15 Testing a Mean.

Department of Engineering Mathematics and Computing

B. Tech. (Second Semester)

Computer system Organization and Logic Design

(MAC- 250201)

L	T	P	C
3	0	0	3

Course Objectives:

- Discuss the basic concepts and structure of computers.
- Understand concepts of register transfer logic and arithmetic operations.
- Explain different types of addressing modes and memory organization.
- Learn the different types of serial communication techniques.
- Summarize the Instruction execution stages.

Unit 1:

Introduction, Milestones in Computer Architecture, Von Neumann Model: Processor Organization- ALU, Control Unit; System Bus, Memory, I/O Devices. Multilevel model of Computer.

Unit 2:

Representation of numbers, integer and floating-point representation, 1's complement, 2's complement, character codes (ASCII, EBCDIC), Boolean Algebra

Unit 3:

Memory Organization: Memory Hierarchy, Memory Properties, Main Memory, Associative Memory, Cache Memory. Machine Language Level (ISA level): Instruction Formats, Addressing Modes, Instruction Types, Flow of Control. RISC v/s CISC.

Unit 4:

Memory mapped I/O and I/O mapped I/O, I/O Techniques: Programmed I/O, Concept of Interrupts, Interrupt driven I/O and DMA, I/O Device Interfaces, I/O Processors, Serial and Parallel Communication, Computer Buses.

Unit 5:

Parallel Architectures: On-chip Parallelism- Instruction Level Parallelism, Onchip Multithreading, Multicore Processor Architecture, Pipelining: RISC Pipeline, Exception handling of Pipelining, Hazards of Pipelining.

Course Outcomes

After completing this course, the students will be able to:

CO's	Description of CO's
CO1	Interpreting the theory of computer system architecture
CO2	Illustrate the different number systems and their operations .
CO3	Demonstrate the concept of memory Organization .
CO4	Structuring the I/O Techniques and communication techniques.
CO5	Recognize the concepts of parallel processing, pipelining and inter processor communication.

Recommended Books

1. William Stallings: Computer Organization and Architecture, Sixth Edition, PHI, 3rd Ed, 2011
2. Sivaraama Dandamudi:Fundamentals of Computer organization and design, Springer, 2ndEd , 2012
3. Andrew S Tanenbaum: Structured Computer Organization, Fourth Edition PHI, 4th Ed, 2014

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE GWALIOR

(A Govt. Aided UGC Autonomous &NAAC Accredited Institute Affiliated to RGPV, Bhopal)

Department of Engineering Mathematics and Computing

B. Tech. (Second Semester)

Differential Equations

(MAC-250202)

L	T	P	C
3	1	0	4

Course Objective

- To understand the concept of Ordinary differential equations
- To familiarize the solution techniques of ODE of higher order with constant and variable coefficients
- To describe how to form partial differential equation
- To explorevarious type of partial differential equation and its application

Unit 1:

Ordinary differential equations of first and higher order, Differential equations in which variables are separable, Homogeneous differential equations, Differential equation reducible to homogeneous form (Non-homogeneous differential of first degree), Linear differential equation (Leibnitz's linear differential equation), Bernoulli's equation of differential equation reducible to linear form, Exact differential equations.

Unit-2:

Linear higher order differential equation with constant coefficients, Homogeneous linear equations or Cauchy's Euler's equations, Solution of simultaneous differential equations.

Unit 3:

Second order differential equations with variable coefficients, Methods: one integral is known, Removable of first derivative, changing of independent variable and variation of parameters, Solution of Differential equation by Series Solution method.

Unit 4:

Introduction of partial differential equation, Formulation of partial differential equation, Linear Partial differential equations of first order and solution techniques Lagrange's method, and Non-LinearPartial differential equations of first orderand standard form I, II, III & IV and Charpit's method.

Unit-5:

Partial differential equations of higher order with constant coefficients, Homogeneousand Non-Homogeneous Linear Partial differential equations, Classification of Partial differential equations, ApplicationofPartial differential equations to solve wave equation and heat equation (one-dimensional) by Separation of variables method.

Course Outcomes

After completing this course, the students will be able to:

CO's	Description of CO's
CO1	Discuss the various methods to solve ordinary differential equations.
CO2	Interpret the solution of ordinary differential equations of higher order with constant and variable coefficients
CO3	Acquire the knowledge of series solution of higher order differential equation
CO4	Examine the concept of Partial differential equations
CO5	Apply the Partial differential equations in various real world problems

Recommended Books:

1. E. Kreyszig: Advance Engineering Mathematics, John Wiley & Sons, 10th Edition (2011).
2. R. K. Jain, S. R. K. Iyengar: Advance Engineering Mathematics, Narosa Publishing House Pvt. Ltd., 5th Edition (2016).
3. B. S. Grewal: Higher Engineering Mathematics, Khanna Publisher, 43rd Edition (2015).
4. H. K. Dass: Advance Engineering Mathematics, S. Chand Publisher (2018).
5. B.V. Ramanna: Higher Engineering Mathematics, McGraw Hill Education, 1st Edition (2017).

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE GWALIOR

(A Govt. Aided UGC Autonomous &NAAC Accredited Institute Affiliated to RGPV, Bhopal)

Department of Engineering Mathematics and Computing

B. Tech. (Second Semester)

Object Oriented Methodology and Programming with C++

(MAC-250203)

L	T	P	C
2	1	2	4

Course Objectives

- To study about the concept of object-oriented programming.
- To create C++ programs that leverage the object-oriented features.
- To apply object-oriented techniques to solve real world problems.

Unit-1:

Object Oriented Paradigm, Features of OOPs: Encapsulation, Class and Object, Inheritance, Reusability, Polymorphism, Abstraction etc; Comparison with Procedural Oriented Programming & Object Oriented Programming, Introduction to C++: Data types; operators, their priority and associativity, steps of program execution, First program in C++ and its basic elements; Function overloading; Default augments; References; Inline functions.

Unit-2:

Classes & Objects: Specification of Class, Visibility Modes: Private, Public, Protected, Defining Member Functions, Creating of Objects, Static Data Member, Static Member Function, Array of Objects, Object as Arguments, Friend Function and Class, Member Function, member initializer list. Constructors and Destructors: Introduction, Types of Constructors- Default Constructor, User Defined Constructor, Parameterized Constructor, Destructors. Deference between class and structure.

Unit-3:

Dynamic Allocations: new and delete; Difference between new, delete, malloc and free; Dynamic allocation of objects; Array of Objects; Mutable data members; Self-referential class; Shallow and Deep Copying, Copy Constructor; The *this* pointer; Static member and this pointer; Proxy classes. Operator overloading: overloading unary and binary operators using member and non-member functions. Type casting: implicit, explicit, dynamic, static, reinterpret, Conversion between objects of various classes.

Unit-4:

Inheritance: Introduction to Code Reuse, Visibility Modes, Types of Inheritance: Single Level, Multilevel, Multiple, Hybrid, Ambiguity in Inheritance; Virtual Base Classes, Constructors in Derived Classes. Polymorphism; Dynamic and static binding; Pure virtual function; Abstract and Concrete Classes; Virtual Destructors; Containership: Nesting of classes.

Unit-5:

Exception Handling: try, catch and throw; catch all exception handler, streams and File: Basic concept and class hierarchy, File I/O Operations; Modes of opening a file; Various types of I/O Operations; Function like; open, read, write, seek, tell. Templates: Function template; class template; Template specialization; Default type arguments and templates. Namespaces and their uses.

Course Outcomes

After completing this course, the students will be able to:

CO's	Description of CO's
CO1	Recognize the concepts of classes & objects and their significance in real world.
CO2	Compare the classes and structures of object-oriented programming.
CO3	Apply appropriate features of C++ to create classes
CO4	Examine the utilization of inheritance and polymorphism in the solution of problems.
CO5	Apply the concepts of file handling

Recommended books

1. H M Deitel and P J Deitel:C++ How to Program, Prentice Hall,1998.
2. Robert Lafore:Object Oriented Programming in Turbo C++,The WAITE Group Press, 1994.
3. D Ravichandran:Programming with C++ By, T.M.H, 2003.
4. E Balagurusamy:Object oriented Programming with C++, Tata McGraw-Hill,2001.
5. Herbert Schildt:The Complete Reference in C++, TMH,2002.
6. G. Booch: Object Oriented Analysis & Design, Addison Wesley, 2006.
7. James Martin: Principles of Object Oriented Analysis and Design, Prentice Hall, 1992.

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Department of Engineering Mathematics and Computing

B. Tech. (Second Semester)

Linear Algebra

(EE (IoT), IT(IoT) & AIR- 250100) & (MAC -250204)

Course Objectives

L	T	P	C
3	1	0	4

- To understand the concept Matrices and its applications
- To understand the various aspect of algebraic structures'
- To explore vector space
- To perceive knowledge of linear transformation and their application

Unit 1:

Matrix, Rank of Matrix, Echelon form, Normal form of matrix, Solution of simultaneous equation by elementary transformation, Consistency of equation, Eigen values and Eigenvectors, Normalized eigenvector, Cayley Hamilton theorem and its application to finding inverse of matrix.

Unit 2:

Introduction of Groups and its properties, Sub-groups, Coset, Lagrange's theorem for finite group, Normal sub-group, Cyclic group, Ring and its properties, Field, Finite field, Integral domain and its properties.

Unit 3:

Vector spaces over the field and its properties, sub-spaces, linear dependent vectors and linear independent vectors, linear span of a set of vectors, basis and dimension of a vector space, sum and direct sum.

Unit 4:

Linear transformation, Kernel and range space of linear transformation, Nullity and Rank, Singular and Non- Singular transformation, Matrix representation of a linear transformation, change of basis and similarity.

Unit 5:

Inner product spaces, Properties of inner product space, Norm space, Schwarz's inequality, Triangular inequality, Parallelogram Law, Orthogonality, Generalized theorem of Pythagoras.

Course Outcomes

After completing this course, the students will be able to:

CO's	Description of CO's
CO1	Apply concept of Matrix in algebraic equations
CO2	Interpret the Group theory and its properties
CO3	Analysis the vector space
CO4	Acquire the knowledge of Linear transformation
CO5	Illustrate the concept of Inner product spaces

Recommended Books:

1. S. Lipschutz and M. Lipson: Linear Algebra,), Schaum's Outline series, Mc- Graw Hill,4th Edition,2009.
2. S. Boyd and L. Vandenberghe: Introduction to Applied Linear Algebra Vectors, Matrices, and Least Squares, University Printing House, Cambridge CB2 8BS, United Kingdom One Liberty Plaza, 20th Floor, New York, NY 10006, USA, 2018.
3. E. Kreyszig: Advance Engineering Mathematics, John Wiley & Sons, 10th Edition, 2011.
4. R. K. Jain, S. R. K. Iyengar: Advance Engineering Mathematics, Narosa Publishing House Pvt. Ltd, 5th Edition 2016.

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Department of Engineering Mathematics and Computing

B. Tech. (Third Semester)

Discrete Mathematical Structures

(MAC – 250302/250400)

L	T	P	C
3	0	0	3

Course Objectives

- To understand the concept Set Theory
- To understand the various aspect of algebraic structures'
- To explore Graph Theory
- To perceive knowledge of tree and discrete numeric functions

Unit 1: Sets, Relations and Functions

Sets, Subsets, Power sets, Complement, Union and Intersection, De-morgan's law Cartesian products, Relations, relational matrices, properties of relations, equivalence relation, functions, Injection, Surjection and Bijective mapping, Composition of functions, Permutations, the characteristic functions and Mathematical induction.

Unit 2: Lattices

Partial order set, Hasse diagrams, upper bounds, lower bounds, Maximal and minimal element, first and last element, , Lattices, sub lattices, Isotonicity, distributive inequality, Lattice homomorphism, lattice isomorphism ,complete lattice ,complemented lattice distribution lattice .

Unit 3: Graphs

Introduction, Operation of graphs (Union, Intersection, complement, product and composition), Sub graph, Fusion of graph, Planer graphs, Region of graph, Euler's formula, Connected graph, Brook's theorem, directed graphs: Types of directed graphs, Digraphs and binary relations, Euler graphs, Hamiltonian paths, Walks and circuits, Graph colouring (vertex colouring), Chromatic Number, upper bound and lower bound of chromatic number, Network flows, Matrix representation of graph.

Unit 4: Trees & Spanning trees

Trees – Rooted and binary trees and Properties, Distance and centres in tree, Spanning trees, Binary Search tree, Spanning trees in a weighted graph, Connectivity and saperability, Network flows, cut sets, Properties of cut set, all cut sets, Fundamental circuits and cut sets.

Unit 5: Discrete Numeric function and Recurrence relation

Introduction to discrete numeric functions and generating functions, introduction to recurrence relations and recursive algorithms, linear recurrence relations with constant coefficients, homogeneous solutions, particular solutions and total solutions

Course Outcomes

After completing this course, the students will be able to:

CO's	Description of CO'
CO1	Acquire the knowledge of Set Theory
CO2	Find the analytical solution of algebraic structures'
CO3	Express the Graph Theory
CO4	Acquire the knowledge of Tree
CO5	Illustrate the concept of discrete numeric functions

Recommended Books:

1. J.P Tremblay and R. Manohar: Discrete Mathematical Structures with Application to Computer science, McGraw Hill, 5th edition, 2008.
2. C.L. Liu: Elements of Discrete Mathematics, Tata McGraw Hill computer science series, 4th edition, 2016.
3. Swapam Kumar Sarkar: Discrete Mathematics, S. Chand & Company, 2nd edition, 2019.
4. Narsingh Deo: Graph Theory, PHI Learning, 3rd edition, 2014.
5. Rosen: Discrete Mathematics and its Applications, McGraw Higher Ed, 7th Edition 2008.

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Department of Engineering Mathematics and Computing

B. Tech. (Third Semester)

Simulation Modelling and Analysis

(MAC – 250301)

L	T	P	C
2	1	0	3

Course Objectives

To understand the system, specify systems using natural models of computation
To explore the modelling techniques
To discuss the prediction of behaviour and decision support

Unit-1: Introduction to System Modeling and Simulation:

Need and use of Simulation, System models, advantage and limitations of models, simplified representation of complex and large system, principles and steps in creating system models, capturing system environment, component of systems and selection of appropriate modeling techniques and simulation methodologies, relationships between selected models & simulation techniques.

Unit-2: System Modeling Concepts:

Types of System Models, Continuous and Discrete Systems, comparison of analytical & simulation methods, event and data modeling, model building, data modeling and techniques of building useful Input data models, multivariate & time series input models, Steps in system model building, Monte Carlo method, verification, calibration & validation of models for simple systems.

Unit-3: Probability and Random Number Generation:

Discrete and continuous random variable, probability functions, descriptive characteristic of a distribution, test of hypothesis and estimation of confidence interval, estimation of errors, parameter estimation, goodness of fit test, numerical computation techniques for continuous and discrete models, distributed lag and cobweb models, Generation of Pseudo Random numbers- Properties of random numbers, Techniques for generating random numbers, testing random number generators, Generating Random-Variates- Inverse Transform technique– Acceptance- Rejection technique, Composition & Convolution Method.

Unit-4: Queuing System and Discrete System Simulation:

Modeling& Generation of Arrival Patterns, Exponential & Poisson distribution, service times, Normal Distribution Queuing Systems, Simulation of Single Server Queuing Systems, Simulation of Multiple Server Queuing Systems, gathering statistics, Measuring occupancy & Utilization

Unit-5: Real World Application of Simulation:

Transfer Line model, Inventory System model, Deadlock Detection model, Computer Center model, Job Shop model, Just-In-Time model, Pi value estimation, Capital recovery model, Economics of Insurance policy, Reliability Estimation, Warranty Problem & Estimation, Computer Network model, Interpretation of Confidence Interval of a Parameter.

Course Outcomes

After completing this course, the students will be able to:

CO's	Description of CO's
CO1	Acquire the knowledge Simulation
CO2	Analyze the discrete and continuous Simulation Models
CO3	Evaluate random generation
CO4	Interpret the queueing models for single & multiple servers
CO5	Determine the real world problem of simulation

Recommended Books:

1. Jerry Banks and John Carson: Discrete Event System Simulation, PHI,Fourth Edition, 2005.
2. Geoffrey Gordon: System Simulation, PHI,Second Edition, 2006.
3. Frank L. Severance: System Modeling and Simulation, Wiley, 2001.
4. Averill M. Law and W.David Kelton: Simulation Modeling and Analysis, McGraw Hill, Third Edition, 2006.
5. Jerry Banks: Handbook of Simulation: Principles, Methodology, Advances, Applications and Practice, Wiley,First edition, 1998.

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Department of Engineering Mathematics and Computing

B. Tech. (Third Semester)

Probability and Random Process

(MAC – 2350300)

Course Objective

- To have knowledge of Central Tendency & Skewness, Kurtosis.
- To describe probability theory and distribution
- To familiarize Correlation and Regression
- To know about the Hypothesis analysis
- To explore the theory of attributes and rules of association

L	T	P	C
3	1	0	4

Unit 1:

Definition–Classical and axiomatic approaches, Laws of total and compound probability, conditional probability, Bayes Theorem., Probability distribution function, Probability density function, Different modes of convergence laws of large numbers, central limit theorem, discrete and continuous probability distributions, some special distributions

Unit 2:

Measures of averages and Standard deviation, moments, moment generating function, skewness and kurtosis, Curve fitting, correlation and regression.

Unit 3:

Testing of Hypothesis, Basic concept of estimation, Concept of the theory of sampling, chi-square (χ^2) distribution, t-distribution, Fisher's Z-distribution, Analysis of Variance

Unit 4:

Concept of Random variable, one dimensional Random variable, two dimensional Random variable, distribution function, Joint probability distribution function, Marginal probability distribution, cumulative probability distribution, conditional distribution function.

Unit 5:

Random process, classification of random process, stationary process, Ergodic process, Markov process, Poisson process, Markov chain, classification of states, matrix transition probabilities, n-step transition probabilities .

Course Outcomes

After completing this course, the students will be able to:

CO's	Description of CO's
CO1	Interpret the theory of Probability and its distributions
CO2	Evaluate the Skewness, Kurtosis, curve fitting, correlation and regression.
CO3	Analyze the test of hypothesis
CO4	Acquire the knowledge of random variables.
CO5	Determine the random process

Recommended Books:

1. M Ray and H.S. Sharma: Mathematical Statistics, Ram Prasad Publications, 3rd Edition 2017.
2. V. K. Kapoor, S.C. Gupta: Statistical Methods, S. Chand& Company, 11th Edition 2018.
3. T. Veerarajan: Probability, Statistics and Random Processes, McGraw Hill, 3rd Edition 2008.
4. S. M. Rose: Introduction to Probability Models, Elsevier, 10th Edition 2011.

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Department of Engineering Mathematics and Computing

B. Tech. (Third Semester)

Operating System Concepts

(MAC - 250303)

L	T	P	C
3	0	0	3

Course Objectives

- Recognize the concepts and principles of operating systems.
- Provide comprehensive introduction to understand the underlying principles, techniques and approaches which constitute a coherent body of knowledge in operating systems.
- To teach understanding how the various elements that underlie operating system interact and provides services for execution of application software.

Unit-1:

Introduction: Evolution of operating systems, Types of operating systems, Different views of operating system, operating system concepts and structure.

Processes: The process concept, systems programmer's view of processes, operating system services for processes management, scheduling algorithms, Performance evaluation.

Unit-2:

Memory Management: Memory management without swapping or paging, swapping, virtual memory, page replacement algorithms, modelling paging algorithms, design issues for paging system, segmentation, Thrashing.

Unit-3:

Inter process communication and synchronization: The need for inter process synchronization, mutual exclusion, semaphores, hardware support for mutual exclusion, queuing implementation of semaphores, classical problems in concurrent programming, critical region and conditional critical region, monitors messages. Deadlocks: Deadlock prevention, deadlock avoidance.

Unit-4:

Mass Storage system – Overview of Mass Storage Structure, Disk Structure, Disk Scheduling and Management, swap space management; File-System Interface – File concept, Access methods, Directory Structure, Directory organization, File system mounting, File Sharing and Protection; File System Implementation- File System Structure, Directory implementation, Allocation Methods, Free Space Management, Efficiency and Performance, Recovery.

Unit-5:

Performance measurement: Monitoring and evaluation introduction, important trends affecting performance issues, why performance monitoring and evaluation are needed, performance measures, evaluation techniques, bottlenecks and saturation, feedback loops.

Case study: Unix Operating System.

Course Outcomes

After completion of this course, the students would be able to:

CO's	Description of CO's
CO1	Outline the basic concept of operating systems
CO2	Analyze the working of operating system
CO3	Examine the working of various scheduling/allocation approaches
CO4	Measure the performance of various scheduling/allocation approaches
CO5	Compare the various operating system problems/issues

Recommended Books:

1. Silberschatz, Galvin: Operating System Concepts, Wiley, 9/E, 2013.
2. StallingWilliam: Operating Systems, Pearson Education, 5/E, 2006.
3. Andrew S. Tanenbaum: Modern Operating Systems, 3/E, PHI, 2006.
4. J. Bach Maurice: The Design of Unix Operating System, Pearson, First Edition, 2015.
5. Bovet &Cesati: Understanding the Linux Kernel, O' Reily, 3/E, 2005.
6. Peter Norton: Complete Guide to Windows XP, SAMS, 2002.

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Department of Engineering Mathematics and Computing

B. Tech. (Third Semester)

Numerical Techniques

(MAC – 250305)

L	T	P	C
2	1	0	3

Course Objective

To perceive the Errors, Algebraic & Transcendental
To expose the concept of Interpolation, Extrapolation, Numerical differential and Integration
To understand Numerical solution of Ordinary Differential Equation
To explore the Finite Difference Methods

Unit 1: Algebraic & Transcendental Function

Introduction to numerical computing, approximations and errors in numerical computations, Bisection method, Regula Falsi method, Newton Raphson method, Secant method, convergence of iterative methods.

Unit 2: Simultaneous Equations & Finite Difference Operators

Solution of simultaneous linear algebraic equations: Gauss elimination, Gauss Jordan method, LU decomposition, Jacobi method, Gauss Seidel method, SOR method, Ill and well condition of equations, finite differences operators, relation between operators.

Unit 3: Interpolation, Numerical Differential and Integration

Newton's forward and backward interpolation, Lagrange interpolation, Newton's divided difference, Inverse Interpolation, Numerical differentiation Numerical integration: Newton-Cotes integration formulas, Trapezoidal, Simpson's rules (1/3 & 3/8) and Weddle rules.

Unit 4: Numerical Solution of Ordinary Differential Equation

Taylor series method, Picard's method, Euler's method, Modified Euler's method, Runge Kutta methods fourth order, Multistep methods: Milne's Predictor corrector method.

Unit 5: Numerical Solution of Partial Differential Equation

Classification of partial differential equation, Finite difference method, Numerical solution of Partial Differential equations, five-point formula, Laplace and Poisson equation.

Course Outcomes

After completing this course, the students will be able to:

CO's	Description of CO's
CO1	Identify the concepts Algebraic & Transcendental Equations
CO2	Acquire the knowledge of finite difference
CO3	Describe numerical integration and differentiation
CO4	Illustrate the problems of ordinary differential equation
CO5	Analyze the Partial differential equations

Recommended Books:

1. R. K. Jain, S. R. K. Iyengar: Advance Engineering Mathematics, Narosa Publishing House Pvt. Ltd., 5th Edition, 2016.
2. S.S. Sastry: Introductory Methods of Numerical Analysis, PHI Learning Private Limited, 4th edition, 2007.
3. J. H. Mathews and K. D. Fink: Numerical Methods using MATLAB, PHI, 4th edition, 2007.
4. C.F. Gerald and P.O. Wheatley: Applied Numerical Analysis, Pearson Education, 6th edition, 2006.
5 M. K. Jain, R. K. Jain and S. R. K. Iyengar: Numerical Methods for Scientific & Engineering, New Age International Pvt Ltd Publisher, 6th Edition (2014).

B. Tech. (Third Semester)
Engineering Mathematics II (100001)

L	T	P	C
3	1	0	4

Objective of Course

- To perceive the transform techniques in engineering problems
- To expose the concept of ordinary and partial differential equations
- To understand vector calculus and its applications
- To explore the statistical abilities

Unit 1:
Fourier series and half range Fourier series, Harmonic analysis, Laplace transform and their basic properties, Convolution Theorem, Applications of Laplace transform to solve the ordinary differential equations.

Unit 2:
Second order differential equations with variable coefficients, Methods: one integral is known, Removable of first derivative, changing of independent variable and variation of parameters, Solution of Differential equation by series method.

Unit 3:
Linear and Non-Linear Partial differential equations of first and second order with constant coefficients, Separation of variable method, Application in solution of wave and heat conduction equations (one-dimensional).

Unit 4:
Vector calculus: Vector differentiation, Divergence, Gradient and Curl, Directional derivative, Solenoidal and Irrotational vectors, Vector Integration, Gauss divergence theorem and Stoke's theorem.

Unit 5:
Concept of Probability and its distributions, probability density functions, probability mass functions, first and second moments about origin and about mean, Binomial, Poisson and Normal distributions and their properties, Bivariate distribution, variance and Covariance, curve fitting correlation & regression.

Course Outcomes
After completing this course, the students will be able to:

CO's	Description of CO's
CO1	Apply the Fourier series and Laplace Transform for solving engineering Problems.
CO2	Solve Ordinary Differential Equation of Second Order.
CO3	Solve Partial Differential equations application for various engineering problems.
CO4	Solve problems of Vector Calculus.
CO5	Apply probability theory with distributions for statistically analysis of given data.

Recommended Books:

1. E. Kreyszig: Advance Engineering Mathematics, John Wiley & Sons, 10th Edition (2011).
2. R. K. Jain, S. R. K. Iyengar: Advance Engineering Mathematics, Narosa Publishing House Pvt. Ltd., 5th Edition (2016).
3. B. S. Grewal: Higher Engineering Mathematics, Khanna Publisher, 43rd Edition (2015).
4. H. K. Dass: Advance Engineering Mathematics, S. Chand Publisher (2018).
4. B.V. Ramanna: Higher Engineering Mathematics, McGraw Hill Education, 1st Edition (2017).

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Department of Engineering Mathematics and Computing

B. Tech. (Third Semester)

Data Structures and Algorithms

(MAC - 250304)

L	T	P	C
2	0	2	3

Course Objectives

- To be familiar with the use of data structures as the foundational base for computer solutions to problems.
- To understand various techniques of searching and sorting.
- To understand basic concepts about stacks, queues, lists, trees and graphs.

Unit-1:

Prerequisites: Array, Structure, pointers, pointer to structure, functions, parameter passing, recursion. Stack and Queue: Contiguous implementations of stack, various operations on stack, various polish notations-infix, prefix, postfix, conversion from one to another-using stack; evaluation of post and prefix expressions. Contiguous implementation of queue: Linear queue, its drawback; circular queue; various operations on queue.

Unit-2:

General List: list and it's contiguous implementation, it's drawback; singly linked list-operations on it; doubly linked list-operations on it; circular linked list; linked list using arrays. Linked implementation of stack and queue,various applications of Linked List, like polynomial representation, Josephus Problem.

Unit-3:

Trees: Definitions-height, depth, order, degree, parent and children relationship etc;Binary Trees- various theorems, complete binary tree, almost complete binary tree; Tree traversals-preorder, pre order and post order traversals, their recursive and non-recursive implementations; expression tree- evaluation; Linked representation of binary tree-operations. Threaded binary trees; forests, conversion of forest into tree. Heap-definition.AVL tree- definition, insertion & deletion operations; Basic idea of B tree and B+ Tree: definition, order, degree, operations and comparison.

Unit-4:

Searching, Hashing and Sorting: Requirements of a search algorithm; sequential search, binary search, indexed sequential search, interpolation search; hashing-basics, methods, collision, resolution of collision, chaining; Internal sorting- Bubble sort, selection sort, insertion sort, quick sort, merge sort on linked and contiguous list, shell sort, heap sort, tree sort.

Unit-5:

Graphs: Related definitions: Graph representations- adjacency matrix, adjacency lists, adjacency multi-list; traversal schemes- Depth first search, Breadth first search; Minimum spanning tree; Shortest path algorithm: Prim's,Kruskal&Dijkstra algorithm. Sparse Matrix.

Course Outcomes

After completion of this course, the students would be able to:

CO's	Description of CO's
CO1	Outline the basics of Algorithms and their performance criteria's.
CO2	Explain the working of linear/Non Linear data structures.
CO3	Identify the appropriate data structure to solve specific problems
CO4	Analyze the performance of various data structures & their applications
CO5	Evaluate the time/space complexities of various data structures & their applications.

Recommended Books:

1. AM Tanenbaum, Y Langsam& MJ Augustein: Data structure using C, PHI, 2007.
2. Robert Kruse, Bruse Leung: Data structures & Program Design in C, Pearson Education, 2007.
3. Richard, Gilberg Behrouz, Forouzan: Data structure – A Pseudocode Approach with C, Thomson press, 2005.
4. Jean – Paul Trembly , Paul Sorenson: An Introduction to Structure with application, TMH, 2007.
5. A. H. Ullman: Data Structures and Algorithms, Pearson Education, 2002. .
6. Sartaj Sahni : Data Structures, Algorithms and Applications in C++, Universities Press, 2014.

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Department of Engineering Mathematics & Computing

(B. Tech. Third Semester)

Transform and Vector Calculus

(MAC – 250401)

Objective of Course

- To perceive the transform techniques in engineering problems
- To expose the concept of Fourier series and Fourier Transform
- To understand Wavelet transform & Z-Transform
- To explore the Vector Calculus

L	T	P	C
2	1	0	3

Unit 1: Fourier Series and Fourier Transform

Introduction, Periodic functions: Even & Odd functions: Properties, Euler's Formulae for Fourier Series, Fourier Series for arbitrary and periodic functions, Dirichlet's conditions, Half Range Fourier Series, Harmonic analysis. Fourier integral, Complex Fourier transform, Inverse Transforms, Convolution Theorems, Fourier sine and cosine transform, Applications of Fourier transform.

Unit 2: Laplace Transform & Its Applications

Definition of Laplace Transform, conditions for existence of Laplace Transform. properties of Laplace transform, Unit step functions, Dirac delta-function. Inverse Laplace transform, convolution theorem, Solution of ordinary differential equations with the initial and boundary conditions.

Unit 3: Z- Transform & Difference Equations

Introduction to Z- transform, Properties of the Z-Transform, Inverse Z-Transform, Convolution, Partial Fraction Method, Residual Method and Solving Linear Difference Equation Using Z-Transform.

Unit 4: Wavelet Transform

Introduction to Wavelet transform, Discrete and Continuous Wavelet Transform, Orthogonal Wavelet Decomposition, MRA, Ortho Normal Wavelets and their Relationship to Filter Banks, Examples of Wavelets, Alternative Wavelet Representations, Non-Separable Multidimensional Wavelets, Embedded Tree Image Coding, Construction of Simple Wavelets.

Unit 5: Vector Calculus

Introduction of Vector calculus, Vector differentiation: Gradient, Divergence, and Curl, directional derivative, Solenoidal and Irrotational vectors, Vector Integration: Line integral, Gauss divergence theorem and Stoke's theorem.

Course Outcomes

After completing this course, the students will be able to:

CO's	Description of CO's
CO1	Identify the concepts of Fourier series and Fourier transform
CO2	Describe Laplace Transform.
CO3	Illustrate the problems of Z- transform & Difference Equations
CO4	Analyze the Wavelet Transform
CO5	Evaluate vector calculus

Recommended Books:

1. B. S. Grewal: Higher Engineering Mathematics, Khanna Publisher, 43rd Edition, 2015.
2. G. ShankerRao: Mathematical Methods, I. K. International Publications, 1st Edition, 2009.
3. J.C. Goswami and A.K. Chan: Fundamentals of Wavelets: Theory, Algorithms, and Applications, 2nd ed., Wiley, 2011.
4. Michel Misiti, Yves Misiti, Georges Oppenheim, JeanMichel Poggi:Wavelets and their Applications, John Wiley & Sons, 2010.
5. Ian N. Sneddon: Fourier Transforms, Dover Publications, 2010.
6. Loknath Debnath: Integral Transforms and their applications, Chapman and Hall/CRC, 2nd edition, 2006.
7. Narayan Shanti and P. K. Mittal: A Text Book of Vector Analysis, S. Chand, Company, 2010 Edition.

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Department of Engineering Mathematics and Computing

(B. Tech. Four Semester)

Theory of Computation

(MAC - 250403)

L	T	P	C
2	1	0	3

COURSE OBJECTIVES:

- To understand computability, decidability, and complexity through problem solving.
- To analyse and design abstract model of computation & formal languages
- To understand and conduct mathematical proofs for computation and algorithms

Unit-1:

Introduction to Theory of Computation: Automata, Computability and Complexity, Alphabet, Symbol, String, and Formal Languages, Examples of automata machines, Finite Automata as a language acceptor and translator, Moore machines and Mealy machines, Composite Machine, Conversion from Mealy to Moore and vice versa.

Unit-2

Types of Finite Automata: Non Deterministic Finite Automata (NDFA), Deterministic finite automata machines, conversion of NDFA to DFA, minimization of automata machines, regular expression, Arden's theorem. Pumping lemma, applications, Closure properties of regular languages, 2 way DFA.

Unit-3

Grammars: Types of grammar, context sensitive grammar, and context free grammar, regular grammar. Derivation trees, Rightmost and Leftmost derivations of Strings, ambiguity in grammar, simplification of context free grammar, killing null and unit productions, conversion of grammar to automata machine and vice versa, Chomsky hierarchy of grammar,. Chomsky Normal Form (CNF) and Greibach Normal Form (GNF).

Unit-4

Push down Automata: Definition, Model, Acceptance of CFL, Acceptance by Final State and Acceptance by Empty stack, Example of PDA, deterministic and non-deterministic PDA, conversion of PDA into context free grammar and vice versa, CFG equivalent to PDA.

Unit-5

Turing Machine: Techniques for construction. Universal Turing machine Multitape, multihead and multidimensional Turing machine, N-P complete problems. Decidability and Recursively Enumerable Languages, decidability, decidable languages, undecidable languages, Halting problem of Turing machine & the post correspondence problem (PCB).

Course Outcomes

After completion of this course, the students would be able to:

CO's	Description of CO's
CO1	Explain the basic concepts of switching and finite automata theory & languages.
CO2	Relate practical problems to languages, automata, computability and complexity.
CO3	Construct abstract models of computing and check their power to recognize the languages.
CO4	Analyse the grammar, its types, simplification and normal form.
CO5	Interpret formal mathematical methods to prove properties of languages, grammars and automata.

Recommended Books:

1. Hopcroft & Ullman: Introduction to Automata Theory Language & Computation, Narosa Publication, 2009.
2. Lewis & Christors: Element of the Theory Computation, Pearson, 2011.
3. Chandrasekhar & Mishra: Theory of Computation, PHI, 2011
4. Daniel I-A Cohen: Introduction to Computing Theory, John Wiley, 2010.

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Department of Engineering Mathematics and Computing

B. Tech. (Fourth Semester)

Number Theory and Cryptography

(MAC - 250405)

L	T	P	C
2	1	NIL	3

Objective of Course

- To Understand the Cryptographical techniques to converting some secret information to not readable texts
- Explore the Cryptographical techniques in various applications such as include military information transmission, computer passwords, electronic commerce, and others.
- Introduce the idea of encryption and public key cryptosystem in the context of algebra and elementary number theory.

Unit 1:
Number theory, Divisibility theory, Modular Arithmetic, primes and their distribution, theory of congruence and its application in security, Congruence: basic definitions and properties, complete and reduced residue systems.

Unit 2:
Integer representations (binary and base expansions, base conversion algorithm), Fermat's Little Theorem and Euler's Theorem, primitive roots, quadratic reciprocity, and Divisibility: basic definition, properties, prime numbers, some results on distribution of primes.

Unit 3:
Arithmetical functions: examples, with some properties and their rate of growth; Continued fractions, and their connections with Diophantine approximations, applications to linear and Pell's equations; Binary quadratic forms; Partition: basic properties and results; Diophatine equations: linear and quadratic, some general equations.

Unit 4:
Overview of cryptography, Encryption, Symmetric Encryption, Plain text, cipher text, Historical Ciphers, Shift Cipher, Substitution Cipher, Vigen'ere Cipher, Permutation Cipher, Symmetric Ciphers, Stream Cipher, Block Ciphers. Symmetric Key Distribution, key management, secret key distribution, public and private key cryptography.

Unit 5:
RSA cryptosystem, Primality Testing and Factoring, Key Exchange and Signature Schemes, Diffie–Hellman Key Exchange, Digital Signature Schemes, Cryptographic hash functions, Authentication, Digital Signatures, Identification, certification, Discrete logarithm problem in general and on finite fields. Polynomials on finite fields, irreducibility and their applications to coding theory.

Course Outcomes

After completing this course, student will be able to:

CO's	Description of CO's
CO1	Acquirethe knowledge of number theory and transcendental numbers
CO2	Describe the divisibility and related algorithms, factorization and quadratic sieve, efficiency of other factoring algorithms.
CO3	Evaluatearithmetical functions, Distribution of primes and Diophantine equations
CO4	Apply cryptography tools in various applications
CO5	Examine the Public key cryptosystems

Recommended Books:

1. Nigel Smart : Cryptography : An Introduction, CRC Press,3rd edition, 2013
2. Neal Koblitz : A course in number theory and cryptography, Springer-Varlag, 2nd edition, 1994.
3. W. Stein: Elementary Number Theory: Primes, Congruences and Secrets, OPAQUE, 2017
4. Burton, David M. Elementary Number Theory, 7th ed., 2011, McGraw-Hill, Inc.
5. Koshy, Thomas. Elementary Number Theory With Applications, 2nd ed., 2007. Elsevier, Inc
6. Robbins, Neville. Beginning Number Theory, 1993. Iowa: Wm. C. Brown
7. P. S. Gill, Cryptography and Network Security, 2011, Oxford Publication
8. Stein, William, Elementary Number Theory: Primes, Congruences, and Secrets: A Computational Approach, 2017, Springer Verlag

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Department of Engineering Mathematics and Computing

B. Tech. (Fourth Semester)

Engineering Mathematics – III (100003)

Objective of Course

- To familiarize with Complex variable
- To know about the formulation of L.P.P. & Its solution.
- To explore the knowledge of numerical techniques

L	T	P	C
3	1	0	4

Unit 1:

Complex Variable, Analytic functions, Cauchy-Riemann equations, Harmonic functions, Milne-Thomson method to find conjugate function, Transformations: Conformal, magnification and rotation, inversion and reflection, bilinear transformation.

Unit 2:

Complex integration, integration of regular function, Cauchy's theorem, Cauchy's integral formula, Taylor's and Laurent's series, Cauchy's residue theorem, evaluation of integrals by residue theorem.

Unit 3:

Introduction of OR, LPP formulation, Graphical method, Simplex method, Big- M method, Duality of LPP, Transportation and Assignment problems.

Unit 4:

Solution of algebraic and transcendental equations by Bisection, Regula-Falsi and Newton-Raphson method, Solution of linear system of equations by Gauss elimination, Gauss-Seidal, and Gauss Jacobi, Interpolation: finite differences, difference operators, Newton's interpolation formulae, Newton's divided difference formula, Lagrange's interpolation formula

Unit 5:

Numerical differentiation up to second order, Numerical integration by Trapezoidal, Simpson's1/3, Simpson's 3/8 Weddle's rule. Numerical solution of differential equations: Euler's method, Taylor's series, Picard's method, Runge- Kutta method of fourth order.

Course Outcomes

After completing this course, the students will be able to:

CO's	Description of CO's
CO1	Describe the Analytic functions
CO2	Solve the Complex Integral Problems
CO3	Find the Optimal Solution using Various Methods of Linear Programming Problem.
CO4	Apply different numerical methods in engineering problem
CO5	Solve Ordinary Differential Equation by Numerical Techniques

Recommended Books:

1. E. Kreyszig: Advance Engineering Mathematics, John Wiley & Sons, 10th Edition (2011).
2. M. K. Jain, R. K. Jain and S. R. K. Iyengar: Numerical Methods for Scientific & Engineering, New Age International Pvt Ltd Publisher, 6th Edition (2014).
3. R. K. Jain, S. R. K. Iyengar: Advance Engineering Mathematics, Narosa Publishing House Pvt.Limited, 5th Edition (2016).
4. B. S. Grewal: Higher Engineering Mathematics, Khanna Publishers, 46rd Edition (2018).
5. B.V. Ramanna: Higher Engineering Mathematics, McGraw Hill Education, 1st Edition (2017).
6. H. A. Taha: Operations Research an Introduction, Pearson, 9th Edition (2014).

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Department of Engineering Mathematics and Computing

Design and Analysis of Algorithms

(MAC - 250404)

L	T	P	C
2	1	0	3

Course Objectives

- To analyze performance of algorithms.
- To choose the appropriate data structure and algorithm design method for a specified application.
- To understand how the choice of data structures and algorithm design methods impacts the performance of programs.

Unit-1:

Review of elementary Data Structures: Stacks, Queues, Lists, Trees, Hash, Graph, Internal representation of Data Structures, Code tuning techniques: Loop Optimization, Data Transfer Optimization, Logic Optimization, etc.

Unit-2:

Definitions of complexity, Time and Space Complexity; Time space tradeoff, various bounds on complexity, Asymptotic notation: O-notation, Ω-notation, Θnotation, Recurrences and Recurrences solving techniques: Recursion-tree method and Master method, Average time analysis methods: Probabilistic methods. Amortized analysis.

Unit 3: Design and analysis of algorithms using the brute-force, greedy, dynamic programming, divide-and-conquer and backtracking techniques.

Unit-4:

Algorithm for sorting and searching, string matching algorithm, Numbertheoretic algorithms, linear programming, Matrix Manipulation algorithms, tree and Graph Algorithms.

Unit-5:

NP-hard and NP-complete problems, Approximations Algorithms, Data Stream Algorithms, Introduction to design and complexity of Parallel Algorithms.

Course Outcomes

After completion of this course, the students would be able to:

CO's	Description of CO's
CO1	Define the basic properties of algorithm.
CO2	Analyze the complexity of an algorithm.
CO3	Apply mathematical preliminaries to analyze and design stages of different types of algorithms.
CO4	Examine algorithms for a number of important computational problems.
CO5	Compare different design techniques to develop algorithms for various computational problems.

Recommended Books

1. Leiserson Cormen, SteinRivest: Introduction to Algorithms, 3rd Edition, PHI, 2010.
2. A.V. Aho, J.E. Hopcroft, J. Ullman: Design and Analysis of Computer Algorithms, Addison Wesley, 1998.
3. Horowitz E. and Sahani: Fundamentals of Computer Algorithms", 2nd Edition, Galgotia Publications, 2008.
4. D. Knuth: Fundamental algorithms: The Art of Computer programming, Volume – I, Third Edition, Pearson Education 1998.
5. D.Knuth: Sorting and Searching: The Art of Computer programming, Volume – III, Second Edition Pearson Education 1998.
6. John Kleinberg, Trades E: Algorithm Design, Pearson Education 2002.

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Department of Engineering Mathematics and Computing

Database Management Systems and SQL

(MAC - 250402)

L	T	P	C
2	1	2	4

Course Objectives

- To explain basic database concepts, applications, data models, schemas and instances.
- To demonstrate the use of constraints and relational algebra operations.
- Describe the basics of SQL and construct queries using SQL.
- To emphasize the importance of normalization in databases, design and concurrency.

Unit-1

Introduction: Advantage of DBMS approach, various view of data, data independence, schema and sub-schema, primary concepts of data models, Database languages, transaction management, Database administrator and users, data dictionary, overall system architecture.

ER model: basic concepts, design issues, mapping constraint, keys, ER diagram, weak and strong entity sets, specialization and generalization, aggregation, inheritance, design of ER schema, reduction of ER schema to tables.

Unit-2

Domains, Relations and Keys: domains, relations, kind of relations, relational database, various types of keys, candidate, primary, alternate and foreign keys.

Relational Algebra & SQL: The structure, relational algebra with extended with extended operations, modifications of Database, idea of relational calculus, basic structure of SQL, set operations, aggregate functions, null values, nested sub queries, derived relations, views, modification of Database, join relations, DDL in SQL.

Database Integrity: general idea. Integrity rules, domain rules, attribute rules, relation rules, Database rules, assertions, triggers, integrity and SQL.

Unit-3

Functional Dependencies and Normalization: basic definitions, trivial and non-trivial dependencies, closure set of dependencies and of attributes, irreducible set of dependencies, introduction to normalization, non-loss decomposition, FD diagram, first, second, third Normal forms, dependency preservation, BCNF, multivalued dependencies and fourth normal form, Join dependency and fifth normal form.

Unit-4

Transaction, concurrency and Recovery: basic concepts, ACID properties, Transaction states, implementation of atomicity and durability, concurrent executions, basic idea of serializability, basic idea of concurrency control, basic idea of deadlock, failure classification, storage structure types, stable storage implementation, data access, recovery and atomicity- log based recovery, deferred Database modification, immediate Database modification, checkpoints.

Unit-5

Distributed Database: basic idea, distributed data storage, data replication, data fragmentation- horizontal vertical and mixed fragmentation.

Emerging Fields in DBMS: Object Oriented Databases-basic idea and the model, object structure, object class, inheritance, Data Warehousing- terminology, definitions, characteristics, data mining and it's overview, Multimedia Databases-difference with conventional DBMS, issues, similarity based retrieval.

Storage structure and file organizations: overview of physical storage media, magnetic disks-performance and optimizations, basic idea of RAID, file organizations, organization of records in files, basic concepts of indexing, ordered indices.

Course Outcomes

After completion of this course, the students would be able to:

CO's	Description of CO's
CO1	Demonstrate the concepts of different type of database system.
CO2	Apply Relational algebra concepts to design database system.
CO3	Make use of queries to design and access database system.
CO4	Analyze the evaluation of transaction processing and concurrency control.
CO5	Determine the optimize database for real world applications.

Recommended Books:

1. Abraham Silberschatz, Henry F. Korth and S. Sudarshan: Database System Concepts, McGraw-Hill 6th Edition.
2. Ramakrishnan Raghu and Gehrke Johannes: Database Management System, McGraw Hill, 3rd Edition.
3. Elmasri & Navathe: Fundamentals of Database System, Pearson Publishing, 6th Edition.2013
4. C.J. Date: An Introduction to Database Systems, Pearson Publishing, 8th Edition.2006
5. Bipin Desai: An introduction to Database System –Galgotia Publications, Revised Edition, 2010

Annexure- IV

Department of Engineering Mathematics and Computing

B. Tech. (Fifth Semester)

Computer Networks

(MAC-250501)

COURSE OBJECTIVES

L	T	P	C
3	0	NIL	3

- To understand the architecture of networks.
- To understand the issues and solution to access shared medium.
- To understand the existing protocols at network and transport layer for design and implementation of computer network.
- To understand the reliability & efficiency related issue in a packet switched networks.

UNIT 1:

Introduction to computer networks & their uses, Different topologies. ISO-OSI model: Layered Architecture, Peer-to-Peer processes and encapsulation, Function and Services of OSI layers; The Physical layer: Digital Signals, Transmission Impairments and Maximum data rate of a channel, Shennons theorem, Nyquist theorem. Transmission media: Guided and Unguided medias. Circuit, Packet and Message switching, virtual Circuit. Introduction to ISDN & its components.

UNIT 2:

The data link layer: Design issues & function, Error detection & correction, Forward error correction Versus Retransmission, Hamming code & CRC codes, Framing: Fixed size and Variable size Frame, Bit stuffing and Byte stuffing. Data link layer protocols: Simplest, Stop and Wait, Sliding window protocols, PPP, SLIP, HDLC. The medium access sublayer: Static and Dynamic Channel Allocation, Protocols: ALOHA Protocol, CSMA (CSMA/CD, CSMA/CA), Collision Free Protocol- Bit Map.

UNIT 3:

IEEE 802 standards for LANs (IEEE 802.3, IEEE 802.4, IEEE 802.5), LAN Devices: HUB, Switches-Learning, Cut-Through and store and forward switches, Bridges: IEEE 802.x to IEEE 802.y, Spanning Tree, Remote Bridge. Internetworking Devices: Routers & gateways. The network layer: Design issues and functions, Internal organization (Virtual Circuit & Datagrams).

UNIT 4:

Routing algorithms: Shortest path routing, Flooding, LSR, Distance Vector Routing, Hierarchical Routing. Introduction to TCP/IP Protocol stack: Protocol Architecture, Classful IP addressing, ARP, RARP, IP Datagrams with options and its delivery, ICMP.

UNIT 5:

Subnet, Supernet, CIDR. Transport Layer: Congestion control, Load Shedding, Jitter control, addressing and multiplexing, Connection establishment and connection release, flow control. Application layer: Introduction to DNS and Email.

CO's	Description of CO's
CO1	Analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies.
CO2	Acquire the knowledge of network layers.
CO3	Specify and identify deficiencies in existing protocols, and then go onto formulate new and better protocols
CO4	Analyze, specify and design the topological and routing strategies for an IP based networking infrastructure
CO5	Understand the issues and solution to access shared medium

RECOMMENDED BOOKS:

1. Tanenbaum A. S., "Computer Networks", Pearson Education, 5th edition, 2011.
2. Behrouz A Forouzan, "Data communication and networking", 4th edition, McGraw- Hill Education, 2017.
3. Comer, "Internetworking with TCP/ IP Vol-1", Pearson education, 6th Edition, 2015.
4. Peterson & Davie, "Computer Networks", 5th Edition, Morgan Kaufmann, 2011.
5. W. Richard Stevens, "TCP/IP Illustrated Vol-1 ", 2nd Edition, Addison-Wesley, 2011.
6. Craig Zacker, "Networking The Complete Reference", 2nd Edition, TMH, 2001.

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Department of Engineering Mathematics and Computing

B. Tech. (Fifth Semester)

Real and Complex Analysis

(MAC-250502)

L	T	P	C
3	1	0	4

Course Objectives:

- To develop understanding of real analysis and to introduce the classical results of complex variable analysis.
- Acquire knowledge about continuity and differentiability of function
- To explain basic concept of Riemann integrals
- Develop the skills to apply complex variable functions in real world problems
- Evaluation of definite integrals by using contour integration techniques.

UNIT 1:

Real System: Introduction, Ordered Sets, Real system and Real Field, Archimedean property of the real-number system, Cauchy-Schwarz inequality, Finite, Countable, and Uncountable Sets, Compact Sets, Heine Borel Theorem, Perfect Sets, Connected Sets, Bolzano-Weierstrass theorem.

UNIT 2

Continuity and Differentiability: Limits of Functions, Continuous Functions, Continuity and Discontinuities, Limits at Infinity, Continuity of Derivatives, Cauchy Criterion for finite limits, Continuity at point and in an interval, Theorems in Continuity, Function continuous on closed interval, Uniform continuity, Theorems on Uniform continuity.

UNIT 3

Riemann and Riemann-Stieltjes Integral: Definition and existence of the integral, Refinement of Partitions, Darboux theorem, Condition of Integrability, Properties of Reimann Integral, Reimann Sums, Integrability of continuous and monotonic function, Definition, Partitions, Sufficient and existence conditions for existence of Riemann-Stieltjes integrals, Upper and lower bounds, Upper and Lower integrals, fundamental theorems of calculus, Mean Value Theorems for Riemann-Stieltjes integrals.

Unit:4

Functions of Complex Variables, Limits, Continuity and differentiability of functions of a complex variable, Analytic functions, necessary and sufficient condition for function to be analytic, Cauchy-Reimann equations, Harmonic functions, Milne-Thomson method to find conjugate function, Conformal Mappings, Bilinear Transformation: magnification and rotation, inversion and reflection.

Unit:5

Integration in a complex plane along a contour, integration of regular function, Cauchy's theorem, Cauchy's integral formula, Morera's theorem, Liouville Theorem, Taylor's and Laurents series, Isolated and non-isolated singularity, poles, residues, Cauchy's residue theorem and its applications.

After successful completion of this course, students will be able to:

CO's	Description of CO's
CO1	Understand basic concept of real number system and their applications in engineering problems.
CO2	Analyse various properties of continuity and uniform continuity and compare them.
CO3	Apply concepts of Riemann Integral to solve engineering problems.
CO4	Understand and Analyse the applications of complex valued function in real world engineering problems.
CO5	Classify various forms of singularities of complex valued functions and their expansion in valid region of convergence.

Recommended Books:

1. Walter Rudin. Principles of Mathematical Analysis (International Series in Pure and Applied Mathematics). 3rd ed. McGraw-Hill, 1976.
2. S C Malik and Savita Arora, Mathematical Analysis, 4th Edition, New Age International Publishers, 2010.
3. S. Ponnusamy, Foundation of Complex Analysis, Narosa Publishing House, 1997.
4. J. W. Brown and R. V. Churchill, Complex variables and applications, MC Graw Hill Higher Education, Eighth Edition 2009.
5. Murray Spiegel, Seymour Lipschutz, John Schiller, Dennis Spellman, Schaum's Outlines: Complex variables, 2nd Edition, McGraw-Hill Education – Europe, 2009

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Department of Engineering Mathematics and Computing

B. Tech. (Fifth Semester)

Software Engineering

(MAC-250503)

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

- To understand the nature of software development and software life cycle process models, agile software development, SCRUM and other agile practices.
- To understand project management and risk management associated with various types of projects.
- To know basics of testing and understanding concept of software quality assurance and software configuration management process.

Unit - I

Introduction to Software Engineering: Definition, software engineering-layered Technology, Software Characteristics and Components, **Software model:** Software Development of Life Cycle Model (SDLC), The Waterfall Model, Iterative Waterfall Model, Prototyping Model, Spiral Model, RAD Model. **Selection criteria of model:** Characteristics of Requirements, Status of Development Team, Users participation, Type of Project and Associated Risk.

Unit - II

Requirement Engineering: Definition, Requirement Engineering Activity, **Types of Requirement**- Functional and Non-functional Requirements, User and System Requirements, Requirement Elicitation Methods, Requirement Analysis Methods, Requirement Documentation (SRS), Requirement Validation, Requirement Management.

Unit - III

Design Concept, Principle and Methods: Design Fundamentals, Design Principles, Effective Modular Design, Design Representations, Architectural design, Procedural design, data Directed design, Real Time Design, Object Oriented Design, Coupling and Cohesion.

Unit - IV

Software Metrics, Project Management and Estimation: Metrics in Process and Project domains, Software Measurement, Software Quality Metrics, **Project Management-** Basics-People, Product, Process, Project, **Estimation-** Software Project Estimation, Decomposition Techniques- Function Point Estimation, Line of Code (LOC) based estimation, Empirical Estimation, COCOMO Model, Project Scheduling Techniques.

Unit - V

Software Testing: Definitions, Software Testing Life Cycle (STLC), Test Case Design, Strategic Approach to Software Testing- Verification & Validation , Strategic issues, Criteria for completion of Testing, Unit Testing, Integration Testing, Validation Testing, System Testing, Black Box Testing Techniques, White Box Testing Techniques, Acceptance Testing.

Course Outcomes

After completing this course, the students will be able to:

CO's	Description of CO's
CO1	Explain the various fundamental concepts of software engineering.
CO2	Develop the concepts related to software design & analysis.
CO3	Compare the techniques for software project management & estimation
CO4	Choose the appropriate model for real life software project.
CO5	Test the software through different approaches.

RECOMMENDED BOOKS:

1. Software Engineering, Sommerville, Pearson, 2016.
2. Software Engineering: A Practitioner's Approach, Roger S. Pressman, McGraw Hill, 2001.
3. Software Engineering, K.K. Agrawal & Yogesh Singh, New Age Publication, 2007.
4. Fundamentals of Software Engineering, Rajib Mall, PHI, 2014.

Department of Engineering Mathematics and Computing

B. Tech. (Fifth Semester)

DATA SCIENCE USING PYTHON

(MAC-250504)

L	T	P	C
2	0	2	4

COURSE OBJECTIVES:

- To provide the fundamental knowledge of Data Science.
- To present the basic representation and exploratory data analysis used in Data Science.
- To understand the working of techniques used in Data Science.

Unit 1:Introduction of basics python tool, Setting working Directory, Creating and saving a script file, File execution, clearing console, removing variables from environment, clearing environment, Commenting script files, Variable creation, Arithmetic and logical operators, Data types and associated operations

Unit 2: Sequence data types and associated operations Strings, Lists, Arrays, Tuples, Dictionary, Sets, Range, NumPy, ndArray

Unit 3:Pandas dataframe and dataframe related operations on different dataset, Reading files, Exploratory data analysis, Data preparation and preprocessing

Unit 4: Linear regression, logistic regression, decision tree, tree creation with entropy and information gain, IDE3 algorithm, random forest, naïve bayes theorem, K-nearest neighbor and different ensemble methods for solving real world problems.

Unit 5:Data visualization on different dataset using matplotlib and seaborn libraries, Scatter plot, Line plot, Bar plot, Histogram, Box plot. Pair plot, Control structures using different dataset, if-else family, for loop, for loop with if breaks, while loop, Functions

BOOKS AND REFERENCES

1. Mastering python for data science, Samir Madhavan

COURSE OUTCOMES:

After completing the course, the student will be able to:

CO1: Define different Data Science techniques.

CO2: Understand different TOOL used for Data Science technique.

CO3: Apply data visualization techniques to solve real world problems.

CO4: Build exploratory data analysis for Data Science methods.

CO5: Build Data Science techniques for solving real world problems.

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B. Tech. (Fifth Semester)

Optimization Techniques

(MAC-250505)

L	T	P	C
3	1	0	4

Objective of Course

- To know how to formulate and solve Linear Programming problem and Non Linear Programming problems
- To familiarize with PERT/CPM techniques
- To explore the Game Theory
- To make the student acquire sound knowledge of inventory models

Linear Programming:
Linear Programming Problem (LPP): Historical development, models and modeling, classification, general methods for solving OR models, Formulation of LPP, Graphical method, Simplex method, Duality theory in linear programming and applications, Dual simplex method, Transportation and Assignment problems.

Non Linear Programming:
Non Linear Programming Problems (NLPP): Introduction of NLPP, constraints problems of maxima and minima, constraints in the form of equations (Lagrangian method), constraints in the form of inequalities. Dynamic Programming: Basic concepts, Bellman's optimality principle, dynamic programming approach in decision making problems, optimal subdivision problems.

Project management PERT and CPM:
Project management, Origin and use of PERT, origin and use of CPM, project network, diagram representation, Critical Path calculation by linear program, Critical Path calculation by network analysis and Critical Path calculation (CPM), determination of floats, construction of time charts and resource labeling, project cost curve and crashing in project management, project evaluation and review techniques (PERT).

Game Theory:
Introduction to game theory, competitive games, finite and infinite games, two persons zero sum game, pure and mixed strategies, saddle point, maxmin and minimax principle, solution of a rectangular game in terms of mixed strategies, Graphical method of (2xm) and (nx2) games.

Inventory models:
Introduction to inventory problems, deterministic models, classical EOQ (Economic Order Quantity) models, inventory models with deterministic demand (No shortage and shortage allowed), Multi item deterministic models, Price break models, and Inventory models with probabilistic demand.

Course Outcomes
After completing of this course, the students will be able to:

CO's	Description of CO's
CO1	Determine the solution of Linear Programming Problem
CO2	Express the solution of Non Linear Programming Problem
CO3	Find the Optimal solution using PERT/CPM
CO4	Acquire the knowledge of Game theory.
CO5	Evaluate the different models of inventory.

Recommended Books:

1. B. E. Gillet: Introduction to Operation Research, Computer Oriented Algorithmic Approach, McGraw Higher Ed, 1st Edition 1984.
2. A. Ravindran and J. J. Solberg: Operations Research Principles, Wiley, 2nd Edition 1987.
3. P. R. Thie and G. E. Keough: An Introduction to Linear Programming & Game Theory, Wiley, 3rd Edition 2008.
4. H. A. Taha: Operations Research an Introduction, Pearson, 9th Edition 2014.
5. I. Griva, S. G. Nash and A. Sofer: Linear and Non Linear Optimization, Taylor & Francis Group, 2014