

B. Tech. in Mathematics and Computing – (Applicable from 2025 admitted Batch onwards)
School of Computer Engineering

Year	THIRD SEMESTER						FOURTH SEMESTER					
	Sub. Code	Subject Name	L	T	P	C	Sub. Code	Subject Name	L	T	P	C
II	SMM 2101	Computational Linear Algebra	3	1	0	4	SMM 2201	Algebraic Structures	2	1	0	3
	SMM 2102	Probability and Stochastic Process	3	0	0	3	SMM 2202	Real Analysis	3	0	0	3
	SMM 2103	Elementary Number Theory	2	1	0	3	SMM 2203	Mathematical Logic & Computability	3	0	0	3
	SMM 2104	Discrete Mathematics	2	1	0	3	SMM 2204	Vector Analysis and Complex Variables	2	1	0	3
	CES 2101	Data Structures	3	1	0	4	CES 2201	Database Systems	3	1	0	4
	CEM 2101	Advanced Programming	3	0	0	3	CES 2204	Operating Systems	3	0	0	3
	CEM 2111	Advanced Programming Lab	0	0	3	1	CES 2211	Operating Systems Lab	0	0	3	1
	CES 2111	Data Structures Lab	0	0	3	1	CEM 2211	Database Lab	0	0	3	1
			16	4	6	22			15	3	6	21
	Total Contact Hours (L + T + P)		26			Total Contact Hours (L + T + P)		24				

Year	FIFTH SEMESTER						SIXTH SEMESTER					
	Sub. Code	Subject Name	L	T	P	C	Sub. Code	Subject Name	L	T	P	C
III	SMS 3003	Foundation of Technology Management	2	1	0	3	SMS 3004	Emerging Economic Landscape	2	1	0	3
	SMM 3101	Multivariate Analysis	3	0	3	4	SMM 3201	Advanced Numerical Methods	3	1	0	4
	SMM 3102	Artificial Intelligence	3	0	0	3	SMM 3202	Time Series Analysis	3	0	3	4
	SMM 3103	Algorithms & Computational Complexity	3	0	0	3	SMP 4XXX	Program Elective–I/Minor Specialization	3	0	0	3
	CEM 3101	Fundamentals of Machine Learning	3	0	3	4	SMP 4XXX	Program Elective–II/Minor Specialization	3	0	0	3
	SMM 3111	Algorithms & Computational Complexity Lab	0	0	3	1	SMM 3211	Scientific Computing Lab	0	0	3	1
	IOE 3XXX	Open Elective –1	3	0	0	3	IOE 3XXX	Open Elective – 2	2	1	0	3
			17	1	6	21			18	3	6	21
	Total Contact Hours (L + T + P)		24			Total Contact Hours (L + T + P)		27				

Year	SEVENTH SEMESTER						EIGHTH SEMESTER					
	Sub. Code	Subject Name	L	T	P	C	Sub. Code	Subject Name	L	T	P	C
IV	SMP 4XXX	Program Elective – III/ Minor Specialization	3	0	0	3	CES 4299	Industrial Training /Internship (MLC)				1
	SMP 4XXX	Program Elective – IV/ Minor Specialization	3	0	0	3	CES/SMM 4999	Capstone Project				12
	SMP 4XXX/ CEP 44XX	Program Elective – V	3	0	0	3	CEH/SMH 5999	Project Work (B Tech – honours)**				20
	SMP 4XXX	Program Elective – VI	3	0	0	3	CEH 5XXX	B Tech – honours (Theory 1**) (V semester)				4
	*****	Program Elective – VII	3	0	0	3	CEH 5XXX	B Tech – honours Theory 2** (VI semester)				4
	IOE 3XXX	Open Elective – 3	3	0	0	3	CEH 5XXX	B Tech – honours Theory 3** (VII semester)				4
	*** 4199	Mini Project (Minor specialization) *				8						
			18	0	0	18/26						13/33
	Total Contact Hours (L + T + P)		18			Total Contact Hours (L + T + P)						

*Applicable to students who opted for minor specialization

**Applicable to eligible students who opted for and successfully completed the B Tech – honours requirements

Minor Specializations:	Other Program Electives:
<p>Optimization & Decision Sciences</p> <ul style="list-style-type: none"> SMM 4301: Linear Optimization SMM 4302: Non-Linear Optimization SMM 4303: Combinatorics & Design of Experiments SMM 4304: Game Theory & Statistical Decisions <p>Algorithms & Coding Theory</p> <ul style="list-style-type: none"> SMM 4305: Applied Graph Theory SMM 4306: Matrix Theory SMM 4307: Advanced Algorithms and Deep Learning SMM 4308: Algebraic Coding Theory 	<ul style="list-style-type: none"> SMP 4401: Big Data Analytics SMP 4402: Computational Fluid Dynamics SMP 4403: Functional Programming SMP 4404: Fuzzy Logic and Neural Networks SMP 4405: Geometric Topology SMP 4406: Mathematics for Finance SMP 4407: Reliability Theory SMP 4408: Theory of Computation SMP 4409: Topology of Metric Spaces SMP 4410 : Advanced Number Theory and Cryptography

B.Tech in Mathematics & Computing

Minor Specialization: Applied Mathematics

SMM 4401 Linear Optimization [3 0 0 3]

Introduction to Linear Programming: Structure, model formulation, Geometry of LPP- Hyperplane, Convex Polyhedron and graphical method. General LP Problems, Standard form, basic solution. Simplex Method, method of penalty, two-phase method. Duality in LPP. Revised Simplex Method. Sensitivity Analysis. Transportation and Assignment problem. Integer Linear Programming. Dynamic programming. Network Analysis in Project planning. Queuing systems, different types of queuing models. Introduction to game theory.

References:

- Bronson Richard, Theory and Problems of Operations Research, Schaum series- MGH, 1983.
- J K Sharma, Operations Research Theory and Applications, Macmillan, 2010
- Hamdy A. Taha, Operations Research, 5th Edition, PHI, 1995
- Hiller and Liberman, Introduction to Operation Research, PHI, 1995.

SMM 4402 Non-Linear Optimization [3 0 0 3]

Introduction to Non-Linear Optimization - Connections with Geometry. Local vs. Global optimum. Problem Classification, Convex and Concave Functions, Properties of Convex Functions, Convex Hulls, Convex Programming, Optimality conditions. Unconstrained optimization. Constrained Optimization. General non-linear programming, quadratic programming- Frank-Wolfe Algorithm, Separable Programming- Method of Approximation Programming. Geometric Programming.

References:

- Hanif D. Sherali & C. M. Shetty Mokhtar S. Bazaraa, Nonlinear Programming: Theory and Algorithms, Wiley Publications 3rd Edition, 2006.
- J K Sharma-Operations Research- Theory and Applications, Macmillan, 2010.
- Mokhtar S. Bazaraa, Hanif D. Sherali, and C. M. Shetty, Nonlinear Programming: Theory and Algorithms, Second Edition, John Wiley & Sons, New York 1993.
- David G. Luenberger, and Yinyu Ye, Linear and Nonlinear Programming, Springer 2016.

Program Elective

SMP 4410 ADVANCED NUMBER THEORY AND CRYPTOGRAPHY

Finite fields – Structures of finite fields, existence and uniqueness of finite fields, Quadratic residues and reciprocity, the Legendre symbol, the Jacobi symbol, square roots of residues. Simple cryptosystems, public key cryptography, RSA, Discrete logs, The Diffie Hellman key exchange system, ElGamal cryptosystem, discrete logs in finite fields, Primality and Factoring- Pseudoprimes, the rho method, Fermat factorization, the continued fraction method and Quadratic Sieve methods. Elliptic curves – Basic facts, Eliiptic curve cryptosystems, Primality test and factoring

References:

- B.Koblitz, A course in Number Theory and Cryptography, Springer, 1994.
- Kenneth Ireland and Michel Rosen, A Classical Introduction to Modern Number Theory, Springer, 2013
- Douglas R. Stinson, Cryptograpy: Theory and Practice, CRC Press, Third Edition, 2005.
- Lawrence C. Washington, Elliptic Curves Number Theory and Cryptography, Chapman & Hall/CRC Taylor & Francis Group, 2008