St. JOHN'S COLLEGE OF ARTS & SCIENCE
(Accredited with B++ by NAAC & Approved by UGC under section 2(f) & 12(B) status)
(Affiliated to Manonmaniam Sundaranar University, Tirunelveli)
(A Christian Minority Institution)
St. John's College Road, Ammandivilai, Kanyakumari District - 629 204,
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ISO 9001:2008
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DEPARTMENT OF MATHEMATICS - ELECTIVE PAPERS

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="6">1.4.1: GRAPH THEORY AND APPLICATIONS</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="6">ELECTIVE - I</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Elective</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">3</td><td rowspan="2">Course Code</td><td rowspan="2"></td></tr>
<tr><td>Semester</td><td>I</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td>Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td>4</td><td colspan="2">2</td><td colspan="2">--</td><td>6</td></tr>
<tr><td colspan="2">Prerequisite</td><td colspan="6">Elementary Number Theory and basic Set Operations in Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="6">To understand and apply the fundamental concepts in Graph Theory, to apply Graph Theory based tools in solving practical problems and to improve the proof writing skills.</td></tr>
<tr><td colspan="2" rowspan="5">Course Outline</td><td colspan="6">UNIT-I : Basic Result: Subgraphs – Degrees of Vertices – Paths and Connectedness – Automorphism of a simple graph – Line graphs – Operations on graphs – Graph Products.
Chapter 1: Sec 1.1 to 1.9.</td></tr>
<tr><td colspan="6">UNIT-II :Connectivity: Vertex Cuts and Edge Cuts – Connectivity and Edge Connectivity – Blocks.
Chapter 3: Sec 3.1 to 3.4.</td></tr>
<tr><td colspan="6">UNIT-III : Trees: Definition, Characterization and simple properties - Centres and centroids - counting the numer of Spanning Trees -Cayley's formula
Chapter 4: Sec 4.1 to 4.5.</td></tr>
<tr><td colspan="6">UNIT-IV : Independent Sets and Matchings: Vertex – Independent Sets and Vertex Coverings – Edge Independent Sets – Matchings and Factors – Matching in Bi-partite Graphs – Perfect Matching and the Tutte Matrix
Chapter 5: Sec 5.1 to 5.6.</td></tr>
<tr><td colspan="6">UNIT-V: Eulerian and Hamiltonian Graphs: Eulerian Graphs-Hamiltonian Graphs-Hamilton's "Around the World" Game Graph Colorings: Vertex colorings-Applications of Graph Colorings-Critical Graphs-Brooks' Theorem.
Chapter 6: Sec 6.1 to 6.3,
Chapter 7: Sec 7.1 to 7.3 (up to Brooks theorem).</td></tr>
<tr><td colspan="2">Recommended Text</td><td colspan="6">R.Balakrishnan and K.Ranganathan, TextBook of Graph Theory, Springer Publications, 2012.</td></tr>
</table>

COURSE	ALLIED PAPER
COURSETITLE	ALLIED PHYSICS – I
CREDITS	3
COURSE OBJECTIVES	To impart basic principles of Physics that which would be helpful for students who have taken programmes other than Physics.

UNITS	COURSE DETAILS
UNIT-I	**WAVES, OSCILLATIONS AND ULTRASONICS:** Simple harmonic motion (SHM) – Composition of two SHMs at right angles (periods in the ratio 1:1) – Lissajous figures – Uses – Laws of transverse vibrations of strings – Determination of AC frequency using sonometer (steel and brass wires) – Ultrasound – Production –Piezoelectric method – Application of Ultrasonics: Medical field.
UNIT-II	**PROPERTIES OF MATTER:** Elasticity: Elastic constants – Bending of beam – Theory of non- uniform bending – Determination of Young's modulus by non-uniform bending. Viscosity: Streamline and turbulent motion – Critical velocity – Coefficient of viscosity – Poiseuille's formula. Surface tension: definition – Molecular theory –Droplets formation–shape, size and lifetime – COVID transmission through droplets.
UNIT-III	**HEAT AND THERMODYNAMICS:** Joule-Kelvin effect – Joule-Thomson porous plug experiment – theory – Temperature of inversion –Liquefaction of Oxygen–Linde's process of liquefaction of air –Thermodynamic system – Thermodynamic equilibrium – Laws of thermodynamics – Heat engine – Carnot's cycle – Efficiency.
UNIT-IV	**ELECTRICITY AND MAGNETISM:** Potentiometer – Principle – Measurement of thermo emf using potentiometer –Magnetic field due to a current carrying conductor – Biot-Savart's law – Field along the axis of the coil carrying current – Peak, average and RMS values of ac current and voltage – Power factor and current values in an AC circuit.
UNIT-V	**DIGITAL ELECTRONICS AND DIGITAL INDIA:** Logic gates, OR, AND, NOT, NAND, NOR , EXOR logic gates – Universal building blocks – Boolean algebra – De Morgan's theorem – Verification – Overview of Government initiatives: Software technological parks under MeitY.
UNIT-VI	**PROFESSIONAL COMPONENTS:** Expert lectures –Seminars — Webinars – Industry inputs – Social accountability – Patriotism
TEXT BOOKS	1. R.Murugesan (2001), Allied Physics, S. Chand and Co, New Delhi. 2. Brijlal and N.Subramanyam (1994), Waves and Oscillations, Vikas Publishing House, New Delhi. 3. Brijlal and N.Subramaniam (1994), Properties of Matter, S.Chand and Co., NewDelhi. 4. J.B.Rajam and C.L.Arora (1976). Heat and Thermodynamics (8^{th} edition), S.Chand and Co.,New Delhi. 5. R.Murugesan(2005), Optics and Spectroscopy, S.Chand and Co, New Delhi. 6. A.Subramaniyam, Applied Electronics 2^{nd} Edn., National Publishing Co., Chennai.

Title of the Course	Foundation course - **Bridge Mathematics**						
Paper Number	**FOUNDATION 1**						
Category Core	**Year**	I	**Credits**	2	**Course Code**	**FC**	
	Semester	I					
Instructional Hours per week	**Lecture**		**Tutorial**		**Lab Practice**	**Total**	
	2		-		--	2	
Pre-requisite	12th Standard Mathematics						
Objectives of the Course	To bridge the gap and facilitate transition from higher secondary to tertiary education; To instil confidence among stakeholders and inculcate interest for Mathematics;						
Course Outline	**UNIT-I:** Algebra: Binomial theorem, General term, middle term, problems based on these concepts						
	Unit II: Sequences and series (Progressions). Fundamental principle of counting. Factorial n.						
	Unit III: Permutations and combinations, Derivation of formulae and their connections, simple applications, combinations with repetitions, arrangements within groups, formation of groups.						
	Unit IV: Trigonometry: Introduction to trigonometric ratios, proof of sin(A+B), cos(A+B), tan(A+B) formulae, multiple and sub multiple angles, sin(2A), cos(2A), tan(2A) etc., transformations sum into product and product into sum formulae, inverse trigonometric functions, sine rule and cosine rule						
	Unit V: Calculus: Limits, standard formulae and problems, differentiation, first principle, uv rule, u/v rule, methods of diff erentiation, application of derivatives, integration - product rule and substitution method.						
Recommended Text	1. NCERT class XI and XII text books. 2. Any State Board Mathematics text books of class XI and XII						

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="7">MATHEMATICS FOR COMPETETIVE EXAMINATION-I</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="7">CORE M3</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Skill Enhance-ment Course</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">2</td><td rowspan="2">Course Code</td><td rowspan="2"></td></tr>
<tr><td>Semester</td><td>I</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td>Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td colspan="2">2</td><td>--</td><td colspan="2">--</td><td>2</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="7">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="7">• To learn the techniques for solving aptitude problems and to enable the students prepare themselves for various competitive examinations.</td></tr>
<tr><td colspan="2" rowspan="5">Course Outline</td><td colspan="7">UNIT-I: Simplification, averages.</td></tr>
<tr><td colspan="7">UNIT-II: Ratio and proportion.</td></tr>
<tr><td colspan="7">UNIT-III: Partnership-percentages.</td></tr>
<tr><td colspan="7">UNIT-IV: Profit and Loss</td></tr>
<tr><td colspan="7">UNIT-V: Problems on numbers.</td></tr>
</table>

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DECLARATION

I hereby declare that the details and information given above are complete and true to the best of my knowledge and belief.

Dr. M. EDWIN GNANADHAS
PRINCIPAL
St. John's College of Arts and Science
Ammandivilai- 629 204