



# SACRED HEART COLLEGE (AUTONOMOUS)

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Ready for  
Every Good Work

A Don Bosco Institution of Higher Education, Founded in 1951 \* Affiliated to Thiruvalluvar University, Vellore \* Autonomous since 1987

Accredited by NAAC (4<sup>th</sup> Cycle – under RAF) with CGPA of 3.31 / 4 at 'A+' Grade

## Sacred Heart College (Autonomous), Tirupattur District

### 1.2.1 List of New Courses

Department: B. SC. Mathematics

## B.Sc. Mathematics

Part	Type	Subject	Paper	Hours	Credits	CIA	Sem	Total
<b>Semester - I</b>								
I	Language	Tamil	I	5	3	30	70	100
II	Language	English	I	5	3	30	70	100
		Communicative English	I		1			
III	Main Core	Differential Calculus (MC)	I	5	5	30	70	100
III	Main Core	Algebra & Trigonometry	II	5	5	30	70	100
III	Allied	Physics	I	6	4	30	70	100
IV	FC*	Personal Skills	I	2	1	-	-	100*
IV	ET/RE*	Religion & Ethics	I	2	1	-	-	100*
		<b>Total</b>		<b>30</b>	<b>23</b>			
<b>Semester - II</b>								
I	Language	Tamil	II	5	3	30	70	100
II	Language	English	II	5	3	30	70	100
		Communicative English			1			
III	Main Core	Integral Calculus (SEC)	III	5	5	30	70	100

III	Main Core	Differential Equations (MC)	IV	5	5	30	70	100
III	Allied	Physics	II	6	4	30	70	100
IV	FC*	Social Skills	II	2	1	-	-	100*
IV	ET/RT*	Ethics / Religion	II	2	1	-	-	100*
		<b>Total</b>		<b>30</b>	<b>23</b>			
<b>Semester - III</b>								
I	Language	Tamil	III	5	3	30	70	100
II	Language	English	III	5	3	30	70	100
III	Main Core	Vector Calculus(SEC)	V	5	5	30	70	100
III	Main Core	Solid Geometry and Fourier Series(SEC)	VI	5	5	30	70	100
III	Allied	Chemistry	I	6	4	30	70	100
IV	FC*	Employability Skills – I	III	2	1	-	-	100*
IV	HR	Human Rights	I	2	1	-	-	100*
V		Deeds						
V		Shelters						
		<b>Total</b>		<b>30</b>	<b>22</b>			

**\*Internal Paper**

Part	Type	Subject	Paper	Hours	Credits	CIA	Sem	Total
<b>Semester - IV</b>								
I	Language	Tamil	IV	5	3	30	70	100
II	Language	English	IV	5	3	30	70	100
III	Main Core	Numerical Methods (DSE)	VII	5	5	30	70	100
III	Main Core	Algebraic Structures - I (MC)	VIII	5	5	30	70	100
III	Allied	Chemistry	II	6	4	30	70	100
IV	FC*	Employability Skills - II	IV	2	1	-	-	100*
IV	EVS*	Environmental Science	I	2	1	-	-	100*
V		Deeds			2			

V		Shelters			2			
		Total		30	26			
<b>Semester – V</b>								
III	Main Core	Real Analysis – I (MC)	IX	6	6	30	70	100
III	Main Core	Algebraic Structures – II (MC)	X	6	6	30	70	100
III	Main Core	Mechanics (DSE)	XI	5	5	30	70	100
III	Main Core	Probability and Statistics (SEC)	XII	5	5	30	70	100
III	Main Elective	Number Theory (SEC) Mathematical Modeling (SEC) Graph Theory (SEC)	XIII	6	4	30	70	100
IV	NME	Mathematics for Competitive Examinations-I	I	2	1	30	70	100
VI	SSP	Mathematical Aptitude - I Mathematical Competence Course			1*			
VI	CC	Mathematical Modeling with Spreadsheet	I		2 <sup>#</sup>			
		<b>Total</b>		<b>30</b>	<b>27+1* +2<sup>#</sup></b>			
<b>Semester – VI</b>								
III	Main Core	Linear Algebra (DSE)	XIV	6	6	30	70	100
III	Main Core	Real Analysis – II (MC)	XV	6	6	30	70	100
III	Main Core	Complex Analysis (DSE)	XVI	6	6	30	70	100
III	Subject Skill	Resource Management Techniques (DSE)	XVII	5	4	30	70	100
III	Subject	Mathematical Statistics	XVIII	5	4	30	70	100

	Skill	(SEC)						
IV	NME	Mathematics for Competitive Examinations - II		2	1	30	70	100
VI	SSP	Mathematical Aptitude –II			1*			
VI	CC	SCILAB for Mathematical Computations	II		2 <sup>#</sup>			
		<b>Total</b>		<b>30</b>	<b>27+1* +2<sup>#</sup></b>			

**\*Internal Paper**

Part	Course	No of Courses	Total No of Hours	Total No of Credits	Total
I	Tamil	4	20	12	20 (12)
II	English	4	20	12	20 (14)
II	Communicative English	2		2	
III	Main Core	18	80	80	120 (108)
III	Main Elective	1	6	4	
III	Subject Skills	2	10	8	
III	Allied Physics I	2	12	8	
III	Allied Chemistry II	2	12	8	
IV	Foundation Course	4	8	4	20 (10)
	ET/RT	2	4	2	
	Environmental Science	1	2	1	

	Human Rights	1	2	1	
	Non Major Elective	2	4	2	
V	Deeds			2	2
	Shelters			2	2
VI	Certificate Course	2		4 <sup>#</sup>	4 <sup>#</sup>
	Self-Study Paper			2*	2*
	<b>Total</b>		<b>180</b>	<b>(148+2*+4<sup>#</sup>)</b>	<b>180</b> <b>(148+2*+4<sup>#</sup>)</b>

### Allied Subjects B.Sc. Maths

Year / Semester	Course	Title of the Paper	Hrs/Week	Cre	Marks		
					CIA	SE	Total
I Year / I Sem	B.Sc., Physics	Allied Mathematics - I	6	5	30	70	100
I Year / I Semester	B.Sc., Chemistry	Allied Mathematics - I	6	5	30	70	100
I Year / I Semester	B.Sc., Computer Science	Allied Mathematics - I	6	5	30	70	100
I Year / I Semester	BCA	Mathematical Foundations – I	6	5	30	70	100

I Year / II Semester	BBA	Allied Business Statistics	6	5	30	70	100
II Year / IV Sem	B.Com	Allied Business Statistics	6	5	30	70	100
II Year / IV Sem	B.Com (CA)	Allied Business Statistics	5	3	30	70	100
I Yr / II Sem	B.Sc., Physics	Allied Mathematics - II	6	5	30	70	100
I Year / II Sem	B.Sc., Chemistry	Allied Mathematics - II	6	5	30	70	100
I Year / II Sem	B.Sc., Computer Science	Allied Mathematics - II	6	5	30	70	100
I Year / II Sem	BCA	Mathematical Foundations – II	6	5	30	70	100
I Year / I Sem	BBA	Allied Business Mathematics	6	5	30	70	100
II Year / III Sem	B.Com	Allied Business Mathematics	6	5	30	70	100
II Year / III Sem	B.Com (CA)	Allied Business Mathematics	5	3	30	70	100
II Year / III Sem	B.Sc., Biochemistry	Bio Statistics –I	6	5	30	70	100
II Year / IVSEM	B.Sc., Biochemistry	Bio Statistics -II	6	5	30	70	100

**Sacred Heart College (Autonomous), Tirupattur District**

**1.2.1 List of New Courses**

**Department: B. SC. Mathematics**

S. No	Course Code	Course Name
1.	M538A	Number Theory
2.	M538B	Mathematical Modeling
3.	NMA503	Mathematics for Competitive Examinations-I
4.	NMA603	Mathematics for Competitive Examinations-II
5.	M539X	Mathematical Competence course

**SYLLABUS**

**Year/Semester: III Year /V Semester**

**Code: M538A**

**Credits: 4**

**Hours/Week: 6**

**Elective:**

**Number Theory**

**Objective:** To study the divisibility, primes, congruences and arithmetic functions in number theory.

**Unit – I: Divisibility**

Introduction – Divisibility, Greatest Common Divisor, Euclid’s Algorithm, Greatest Common Divisor via Euclid’s Algorithm – Least Common Multiple – Representation of Integers, Decimal Representations of Integers, Binary Representations of Integers (Chapter 2: Sections 2.1 to 2.4, Related Problems)

**Unit – II: Primes**

Introduction – Primes, Prime counting function, prime number theorem, Test of primality by trial division - Sieve of Eratosthenes, Canonical Factorization, Fundamental theorem of

arithmetic, Sieve of Eratosthenes, Determining the canonical factorization of a natural number (Chapter 3: Sections 3.1 to 3.3, Related Problems)

### **Unit – III: Congruences**

Introduction – Congruences and Equivalence Relations, Equivalence Relations – Linear Congruences – Linear Diophantine Equations and the Chinese Remainder Theorem (Chapter 4: Sections 4.1 to 4.4, Related Problems)

### **Unit – IV: Congruences (continued)**

Polynomial Congruences – Modular Arithmetic: Fermat’s Theorem – Wilson’s Theorem and Fermat Numbers – Pythagorean Equation (Chapter 4: Sections 4.5 to 4.8, Related Problems)

### **Unit – V: Arithmetic Functions**

Introduction – Sigma function, Tau function, Dirichlet product – Dirichlet Inverse, Moebius function, Euler’s Function, Euler’s Theorem, An application of algebra (Chapter 5: Sections 5.1 to 5.3, Related Problems)

### **Book for Study:**

Neville Robinns, Beginning Number Theory, 2<sup>nd</sup> Ed., Narosa Publishing House Pvt. Limited, Delhi, 2006.

### **Books for Reference :**

David M. Burton, Elementary Number Theory 6<sup>th</sup> Ed., Tata McGraw-Hill Edition, Indian reprint, 2007.

Neville Robinns, Beginning Number Theory, 2<sup>nd</sup> Ed., Narosa Publishing House Pvt. Limited Delhi, 2007.

Richard E. Klima, Neil Sigmon, Ernest Stitzinger, Applications of Abstract Algebra with Maple, CRC Press, Boca Raton, 2000.



**Year/Semester: III Year /V Semester**

**Code: M538B**

**Credits: 4**

**Hours/Week: 6**

**Elective:**

### **Mathematical Modeling**

**Objective:** This course aims at the study and to discuss the mathematical modeling through differential equations, systems of ordinary differential equations, difference equations, graphs, calculus of variations and dynamical programming.

#### **Unit - I: Mathematical Modeling: Need, Techniques, Classifications and Simple Illustrations**

Simple Techniques requiring Mathematical Modeling – The Technique of Mathematical Modeling – Classification of Mathematical Models – Some Characteristics of Mathematical Models – Mathematical Modeling through Geometry – Mathematical Modeling through Algebra – Mathematical Modeling through Trigonometry. (Chapter 1: Sec: 1.1 – 1.7)

#### **Unit - II: Mathematical Modeling through Ordinary Differential Equations of First Order**

Mathematical Modeling Through Differential Equations – Linear Growth and Decay Models – Non-Linear Growth and Decay Models – Compartment Models – Mathematical Modeling in Dynamics through Ordinary Differential Equations of First Order - Mathematical Modeling of Geometric Problems Through Ordinary Differential Equations of First Order. (Chapter 2: Sec: 2.1 -2.6)

#### **Unit - III: Mathematical Modeling through Systems of Ordinary Differential Equations of First Order**

Mathematical Modeling in Population Dynamics – Mathematical Modeling of Epidemics through Systems of Ordinary Differential Equations of First Order – Compartment Models through Systems of Ordinary Differential Equations – Mathematical Models in Medicine, Arms Race, Battles and International Trade in terms of Systems of Ordinary Differential Equations. (Chapter 3: Sec: 3.1, 3.2, 3.3, 3.5)

#### **Unit - IV: Mathematical Modeling through Ordinary Differential Equations of Second Order**

Mathematical Modeling of Planetary Motions – Mathematical Modelling of Circular Motion and Motion of Satellites – Mathematical Modeling through Linear Differential Equations of Second Order. (Chapter 4: Sec: 4.1, 4.2, 4.3 (4.3.1 & 4.3.2 only))

## **Unit - V: Mathematical Modeling Through Difference Equations**

The Need for Mathematical Modelling through Difference Equations: Some Simple Models – Basic Theory of Linear Difference Equations with constant co-efficients - Mathematical Modelling Through Difference Equations in Population Dynamics and Genetics (Chapter 5: Sec: 5.1, 5.2 & 5.4)

### **Book for Study:**

J.N. Kapur, Mathematical Modelling, New Age International (P) Ltd., Publishers, Reprint 2000.

### **Books for Reference:**

Belinda Barnes, Glenn Robert Fulford, Mathematical Modelling with case studies, Chapman & Hall/CRC, 2009.

Brian Albright, Mathematical Modeling with Excel, Jones and Bartlet Publishers, LLC, First Indian Edition, 2010.

Dilwyn Edwards, Mike Hamson, Guide Mathematical Modelling, PALGRAVE, St.Martin's Press, LLC, Reprint 2007.

Glenn Fulford , Peter Forrester , Arthur Jones Modelling with Differential and Difference Equations, Cambridge University Press 1997.

R.Robert Huckfeldt, C.W.kohfeld, Thomas W.Likens, Dynamic modeling An Introduction, SAGE Publications, 1982.

E – Learning source: [https://people.maths.bris.ac.uk/~madjl/course\\_text.pdf](https://people.maths.bris.ac.uk/~madjl/course_text.pdf).

**Year/Semester: III Year /VI Semester**

**Code: NMA503**

**Credit: 1**

**Hours/Week: 2**

**Elective - I**

**Non-Major Elective - I**

**Mathematics for Competitive Examinations – I**

**Unit-I:**

**Average-Problems on numbers (Chapters 6, 7)**

**Unit-II:**

Ratio and proportion (Chapter12)

**Unit -III:**

Time and work–Time and distance (Chapters 15, 17).

**Unit-IV:**

Simple interest and compound Interest (Chapters 21, 22).

**Unit- V:**

Permutations and combinations (Chapter 30).

**Book for Study:**

Dr. R.S. Aggarwal, Quantitative Aptitude (for Competitive Examinations), Revised Edition, S. Chand and Company Ltd., Ram Nagar, New Delhi, Reprint 2012.

E-learning source: [www.tcyonline.com/tests/mathematics-competitive-exam](http://www.tcyonline.com/tests/mathematics-competitive-exam)

**Question Paper Pattern:** 100 Objective type questions each carrying 0.75 mark for semester examinations.

**Year/Semester: III Year /VI Semester**

**Code: NMA603**

**Credit: 1**

**Hours/Week: 2**

**Elective - II**

**Non-Major Elective - II**

**Mathematics for Competitive Examinations – II**

**Objective:** To prepare the students for competitive examinations.

**Unit - I:**

Profit and Loss-Partnership (Chapters 11, 13)

**Unit - II:**

Problems on trains - Boats and streams (Chapters 18, 19)

**Unit - III:**

Problems on Calendars and Clocks (Chapters 27, 28).

**Unit - IV:**

Probability- True Discount (Chapters 31, 32).

**Unit - V:**

Data interpretation problems- Tabulation- Bar graphs (Chapters 36 and 37 ).

**Book for Study:**

Dr. R.S. Aggarwal, Quantitative Aptitude (for Competitive Examinations), Revised Edition, S. Chand and Company Ltd., Ram Nagar, New Delhi, Reprint 2012.

E-learning source: [www.tcyonline.com/tests/mathematics-competitive-exam](http://www.tcyonline.com/tests/mathematics-competitive-exam)

**Question Paper Pattern:** 100 Objective type questions each carrying 0.75 mark for semester examinations.

## **Mathematical Competence Course (SSP)**

**Objective:** To train the students to acquire knowledge for appearing/ Preparing NBHM and all India PG entrance exams other competitive exams.

### **Unit – I: Calculus**

Local minimum and maximum values – Extreme Values – Sequence series – Binomial, Exponential and Logarithmic series – Differentiation and Integration – Differential equation – Partial difference equations.

### **Unit – II: Vector Analysis**

Gauss divergence theorem – Greens theorem – Stocks theorem – Line, Surface and Volume Integrals – Derivatives of vector valued function – Curl, divergence and grad.

### **Unit – III: Matrix**

Linear transformations – vector space – Linear dependent and independent – Eigen values and Eigen vectors – Orthogonal – Rank of Matrix.

### **Unit – IV: Analysis**

Sequences – Series – Convergence - divergence sequence – monotonically increasing and decreasing – Cauchy – uniform continuous – continuous - differentiable – Derivatives – Metric space – Radius of convergence – Compactness –Residue theorem –connectedness.

### **Unit – V: Algebra**

Sets - Polynomials – Groups – Sub groups – Permutation group–finite group – Cyclic group – Ring – Ideal – Field.

**Books for Reference:** IIT - JAM model questions and solutions.

Abosos Ali Shaikh, Vector Analysis with Applications, Narosa publications, New Delhi, 2009.

B.L. Agarwal, Vector Analysis, Pragati Prakasham Publications, 1966

- P.N. Arora and Ranjit Singh, First course in Real Analysis, Third edition, Sultan Chand and Sons Publishers, New Delhi, 1981.
- S. Arumugam, Modern Analysis, New Gamma Publishers, Palayamkottai, 1993.
- P. Duraipandian, Laxmi Duraipandian, Vector Analysis, Emerald Publishers, Chennai, Reprint 1987.
- I.N. Herstein, Topics in Algebra, John Wiley and sons, 2-e, New Delhi, 2006.
- T.K. Manicavachagom Pillay, T. Natarajan and K.S. Ganapathy, Algebra Volume I, S.Narayanan and T.K.ManicavachagomPillay, Calculus Volume I & II, S.Viswanathan Printers Pvt.Ltd, Chennai, 2012.
- S. Narayanan and T.K. Manicavachagom Pillay, Trigonometry, S. Viswanathan (Printers and Publishers) Pvt. Ltd., Chennai, 2011.
- Tom M. Apostol, Mathematical Analysis, Indian student second edition, Narosa Publishing House, Chennai, 2002.