DEPARTMENT OF MATHEMATICS

1) Name of the Department	partment	De	the	of	Name	1)
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: Mathematics

2) Year of Establishment

: UG – 2001 (on non-grant basis) UG – 2010 (on grant basis)

3) Scope and importance of the department:

Introduction to Mathematics What is mathematics?

Mathematics has been defined in many ways throughout the ages. Today, maths is an inevitable part of science and it is used in almost every field be it natural science, engineering, art or economics. Applied mathematics has always been leading to important discoveries and giving birth to new disciplines. Another great source is Merriam Webster's dictionary and according to this mathematics is defined as the science of numbers and their operations, interrelations, combinations, generalizations and abstractions and of space configurations transformations and generalizations.

The importance of Mathematics

The everyday use of arithmetic and the display of information by means of graphs, are an everyday commonplace. These are the elementary aspects of mathematics. Advanced mathematics is widely used, but often in an unseen and unadvertised way.

The mathematics of error-correcting codes is applied to CD players and to computers.

The stunning pictures of far away planets sent by Voyager II could not have had their crispness and quality without such mathematics.

Voyager's journey to the planets could not have been calculated without the mathematics of differential equations.

Whenever it is said that advances are made with supercomputers, there has to be a mathematical theory which instructs the computer what is to be done, so allowing it to apply its capacity for speed and accuracy.

The development of computers was initiated in this country by mathematicians and logicians, who continue to make important contributions to the theory of computer science.

The next generation of software requires the latest methods from what is called category theory, a theory of mathematical structures which has given new perspectives on the foundations of mathematics and on logic.

The physical sciences (chemistry, physics, oceanography, astronomy) require mathematics for the development of their theories. In ecology, mathematics is used when studying the laws of population change. Statistics provides the theory and methodology for the analysis of wide varieties of data. Statistics is also essential in medicine, for analysing data on the causes of illness and on the utility of new drugs. Travel by aeroplane would not be possible without the mathematics of airflow and of control systems. Body scanners are the expression of subtle mathematics, discovered in the 19th century, which makes it possible to construct an image of the inside of an object from information on a number of single X-ray views of it. Thus mathematics is often involved in matters of life and death. These applications have often developed from the study of general ideas for their own sake: numbers, symmetry, area and volume, rate of change, shape, dimension, randomness and many others. Mathematics makes an especial contribution to the study of these ideas, namely the methods of Precise definitions; Careful and rigorous argument; representation of ideas by many methods, including symbols and formulae, pictures and graphics; Means of calculation; And the obtaining of precise solutions to clearly stated problems, or clear statements of the limits of knowledge.

These features allow mathematics to provide a solid foundation to many aspects of daily life, and to give a comprehension of the complexities inherent in apparently quite simple situations. For these reasons, mathematics and calculation have been associated from earliest times. In modern times, the need to perform rapid mathematical calculations in war time, particularly in ballistics, and in decoding, was a strong stimulus to the development of the electronic computer. The existence of high speed computers has now helped mathematicians to calculate and to make situations visual as never before. Also this calculation has developed from numerical calculation, to symbolic calculation, and currently to calculation with the mathematical structures themselves. This last is very recent, and is likely to lead to a major transformation. These capacities change, not the nature of mathematics, but the power of the mathematician, which increases perhaps a million fold the possibility to comprehend, to argue, to explore. There is also a reverse interaction. The notion of computing would not have made sense without Mathematics, and it was the analysis of the methods of Mathematics by mathematicians, philosophers, logicians and engineers which led to the concept of a programmable computer. Indeed, two mathematicians, von Neumann in the USA and Turing in the UK, are known as the fathers of the modern computers. Analysis of computing, and attempts to make it as reliable as possible, needs deep Mathematics, and this need is likely to grow. A computer, unless it is programmed, is just a box made of metal, glass, silicon, etc. Programming expresses algorithms in a form suitable for the computer. Mathematics is needed as a language for specification, for determining what is to be done, how and when, and for the verification that the programs and algorithms work correctly. Mathematics is essential for the correct use of computers in most of their applications and the mathematical needs of computing have sparked off many new and exciting questions. Thus computers, while they have, fortunately, done away with the need for humans to carry out routine calculations, have also required from mathematicians a deeper analysis of the process and logic of computation, and its representation in a machine. The imagination of mathematicians is also stirred by its rigorous nature, which forces them to follow through the logic of their ideas. There are many examples of mathematicians producing apparently strange and inapplicable theories, noting simply that this is the way the mathematics seems to go, only to find these vindicated perhaps decades later by surprising applications. A recent example is the theory of knots, which was developed as a part of pure mathematics since 1870. A wonderful advance in 1985 showed how the theory could be applied in physics in relation to quantum theory, and in biology in relation to the way DNA unknots itself before dividing. Similarly, modern notions of chaos and fractals were pioneered by mathematicians in the early years of this century. Now fractals are a practical tool for compressing data on computer

discs. The study of mathematics can satisfy a wide range of interests and abilities. It develops the imagination. It trains in clear and logical thought. It is a challenge, with varieties of difficult ideas and unsolved problems, because it deals with the questions arising from complicated structures. Yet it also has a continuing drive to simplification, to finding the right concepts and methods to make difficult things easy, to explaining why a situation must be as it is. In so doing, it develops a range of language and insights, which may then be applied to make a crucial contribution to our understanding and appreciation of the world, and our ability to find and make our way in it.

Careers for those who love Mathematics:

Mathematics is as old as civilization itself and is one of the most useful and fascinating branches of human knowledge. It encompasses many topics of study and as such it is difficult to define the term "mathematics" which comes from a Greek word meaning "inclined to learn". It may, however, be broadly defined as the scientific study of quantities, including their relationships, operations and measurements expressed by numbers and symbols. In simple words, mathematics deals with study of numbers and their various calculations. The most important skills in mathematics are careful analysis and reasoning, and thus logic is the floor on which the structure of mathematics is built.

Skills and Personal Qualities:

Mathematicians use mathematical theory, computational techniques, algorithms and the latest computer technology to solve economic, scientific, engineering, physics, and business problems. Professionals are often a part of an interdisciplinary team that may include economists, engineers, computer scientists, physicists and technicians. Deadlines, overtime work, special requests for information or analysis, and prolonged travel to attend seminars or conferences may be part of their job.

Operations Research Analysts: Operations research has been defined as an interdisciplinary branch of applied mathematics and formal science that uses advanced analytical methods such as mathematical modelling, statistical analysis, and mathematical optimization to arrive at optimal or near-optimal solutions to complex decision-making problems. Operations research analysts formulate and apply mathematical modelling methods to develop and interpret information that assists management with policy formulation and other managerial functions. They help managers to make better decisions and solve problems. If you're planning to take this profession be sure you have a thorough knowledge of strong quantitative and computer skills: an advanced knowledge in mathematics.

Mathematician: A mathematician is a person whose primary area of study or research is mathematics. Mathematicians are concerned with particular problems related to logic, space, transformations, numbers and more general ideas which encompass these concepts. They do research, come up with problems and solutions, etc.

Chartered Accountant: With the rapid growth in economy, careers in finance and accounts have gained tremendous popularity and the most esteemed career option in this filed is that of Chartered Accountant. A Chartered accountant is somebody who specializes in accounting, auditing and taxation.

Software Engineers: A highly fulfilling career, software engineers design and develop

software. They apply the theories and principles of computer science and mathematical analysis to create, test, analyse and evaluate the software applications and systems that make computers work. Software engineers are also experts in theory of computing systems, the structure of software, and the nature and limitations of hardware to ensure that the underlying systems will work properly. Professionals in this field have excellent prospects in the next five to 10 years.

Banking: You could work in any one of the following areas in Banking – accountant, customer service, front desk, cash handling, account opening, current account, savings account, mortgage loan underwriter, loan processing officer, back end operations, product marketing and sales executive, recovery officer, retail asset manager, property appraiser and customer service executive. As banks provide loans for setting up business and for various development work and thereby generate thousands of jobs and career opportunities in the banking finance sector.

Teachers: If you have an affinity for numbers, you can pursue a career in teaching. A maths teacher is always on demand as this is considered one of the main subjects throughout schooling. It is a highly paid job in India as many maths teachers provide coaching or tuition to students. Mathematicians who work in academia usually have a mix of teaching and research responsibilities.

Computer Systems Analysts: Professionals in this field use IT tools to help enterprises of all sizes achieve their goals. Most systems analysts work with specific types of computer systems – for example, business, accounting, and financial systems or scientific and engineering system to prepare cost-benefit and return-on-investment analysis to help management decide whether implementing the proposed technology would be financially feasible. Mathematics offer opportunities in Software, Insurance, Market Research, Education, Securities, Banking Sector, Economics, Engineering, Computer Science etc.

4) Introduction of Department:

Mathematics Department was running on non – grant basis from 2001 to 2010. Mathematics department become granted in June 2010. It was an attempt of Management to make available the new trends of education by introducing the Science Faculty in the college. The Department of the Mathematics from the time of its establishment has tried to enrich the knowledge of student regarding the idea of mathematics and application of mathematics to different branches of science. Mr. A. D. Godse was working as the Head of the Department and contributed in enriching the department for the best of students during 2010 - 2011. Dr. S.V. Sarode joined the department in December 2010 as Assistant Professor. In July 2011 Mr. A. D. Godse was transferred to V. P. College, Vaijapur. After July 2011 Dr. S. V. Sarode was working as the Head of the Department. In April 2018, Dr. S. N. Bidarkar transferred to this college from Shivaji college, Parbhani and in July 2018 take a charge of Head of this Department. The department is actively participating in both curricular and co-curricular activities like teaching, evaluation, research and science exhibition.

Department has been offering undergraduate course in Mathematics for many years, The current topics of interest in the department are Differential equations, Partial Differential Equations, Algebra, Number Theory, Lattice Theory and Graph Theory. 5) Detail of Programmes / Courses offered (UG, PG, M. Phil., Ph.D., Integrated Masters; Integrated Ph.D., Short term courses, Career oriented courses, etc. (Current academic year i. e. 2021-2022)

Sr. No	Programme level	Name of the programme/ Course	Duration	Entry qualification	Medium of Instruction	No. of Student admitted
1	UG	B. Sc.	3Years	12th Pass	English	117

6) Faculty profile with name, qualification, designation, specialization

Sr.	Name of the Faculty	Qualification	Designation	Specialization
No.				
1.	Dr. S. N. Bidarkar	M.Sc., NET,	Head and	Differential
		Ph. D.	Associate	Equation
			Professor	
2.	Dr. S. V. Sarode	M.Sc., SET,	Assistant	Lattice Theory
		Ph. D.	Professor	and Graph
				Theory

7) Student profile program/ course wise: (2016 -17 to 2021 - 22)

	Name of the	Enre	olled	Total
Academic Year	Course / Programmer	Μ	F	
2016-17	B.Sc.F.Y.	78	27	105
	B.Sc.S. Y.	69	16	85
	B.Sc.T. Y.	47	20	67
2017-18	B.Sc.F.Y.	51	19	72
	B.Sc.S. Y.	38	8	46
	B.Sc.T. Y.	57	11	68
2018-19	B.Sc.F.Y.	30	23	53
	B.Sc.S. Y.	38	15	53
	B.Sc.T. Y.	30	4	34
2019-20	B.Sc.F.Y.	52	20	72

	B.Sc.S. Y.	51	16	67
	B.Sc.T. Y.	40	17	57
2020-21	B.Sc.F.Y.	17	11	28
	B.Sc.S. Y.	52	20	72
	B.Sc.T. Y.	51	16	67
2021-22	B.Sc.F.Y.	30	37	67
	B.Sc.S. Y.	13	8	21
	B.Sc.T. Y.	20	9	29

8) Details of student Result (2016 -17 to 2021 - 22)

Academic Year	Name of the Course / Programmer	No of students appear	Total No of students passed	Percentage
2016 -17	B.Sc.F.Y.	105	98	93.33
	B.Sc.S.Y.	85	75	88.23
	B.Sc.T.Y.	67	60	89.55
2017-18	B.Sc.F.Y.	112	107	95.53
	B.Sc.S.Y.	91	87	95.6
	B.Sc.T. Y.	68	66	97.05
2018-19	B.Sc.F.Y.	80	73	91
	B.Sc.S. Y.	60	54	90
	B.Sc.T. Y.	49	45	91
2019-20	B.Sc.F.Y.	84	84	100
	B.Sc.S. Y.	77	77	100
	B.Sc.T. Y.	67	66	98

2020-21	B.Sc.F.Y.	46	27	58
	B.Sc.S. Y.	55	20	36
	B.Sc.T.Y.	54	28	51

9) Student-Teacher Ratio (Program wise): (2016 -17 to 2021-2022)

Year	First Year	Second Year	Third year
2016-17	105: 3	85:3	67:3
2017-18	72:1	46:1	68:1
2018-19	53:2	53:2	34:2
2019-20	72:2	67:2	57:2
2020-21	28:2	72:2	67:2
2021-22	67:2	21:2	29:2

10) On-going /completed research projects by faculty funded by governmental and nongovernmental agencies (2016-17 to 2021-22)

Sr. No	Name of the principal investigator	Duration of the project	Name of the research project	Amount fund received	Name of funding agency	Date of sanction	Year of Completi on
1	Dr. S. N. Bidarkar	1 Year	"Extension of Solutions To Some Nonlinear Ordinary Differential Equations"	42,000/-	Dr. B.A.M. University, Aurangabad	March- 2019	March- 2020

11) Research papers publication

Sr. No	Title of the Research Paper	Authors	Year	Name of the Journal, Vol. & Page Nos.	ISSN	National/ Internationa I/ Impact Factor/ UGC Care Listed
1	Online Education Through MOOC's SWAYAM & NPTEL	Dr. S .N. Bidarkar	2018	The South Asian Academic Research Chronicle, September 2018Volume V	ISSN-2454- 1109	International

2	Some Miscellaneous Types Of Ordinary Differential Equations (p.n.145-152)	Dr. S .N. Bidarkar	2019	An International Multidisciplina ry Quarterly Research Journal, Jan- Mar 2019Volume - VIII Issue-I	ISSN-2277- 5730	International
3	Existence and Uniqueness Theorem of Ordinary Differential Equations with Initial Value Problem	Dr. S .N. Bidarkar	Febr uary- 2020	Online <u>Research</u> <u>Journal Our</u> <u>Heritage</u> <u>Journal,</u> February-2020 Volume 68Special Issue 12 Page No. 461- 465	ISSN : 0474- 9030	UGC CARE LISTED and peer- reviewed open access Journal
4	Ordinary Differential Equations with IVP using Weierstrass M- Test	Dr. S .N. Bidarkar	Febr uary- 2020	<u>Online</u> <u>Research</u> <u>Journal Our</u> <u>Heritage</u> <u>Journal,</u> February-2020 Volume 68Special Issue 38 Page No. 670- 673	ISSN : 0474- 9030	UGC CARE LISTED and peer- reviewed open access Journal
5	Existence and Uniqueness of solution of Second Order Nonlinear Ordinary Differential Equations	Dr. S .N. Bidarkar	Febr uary- 2020	<u>Online</u> <u>Research</u> <u>Journal Our</u> <u>Heritage</u> <u>Journal,</u> February-2020 Volume 68Special Issue 6 Page No. 61-65	ISSN : 0474- 9030	UGC CARE LISTED and peer- reviewed open access Journal
6	Learning Outcome- based Pedagogy for Teaching Mathematics in Higher Education	Dr. S .N. Bidarkar	Febr uary- 2020	<u>Online</u> <u>Research</u> <u>Journal Our</u> <u>Heritage</u> <u>Journal,</u> February-2020	ISSN : 0474- 9030	UGC CARE LISTED and peer- reviewed open access

				Volume 68Special Issue 6 Page No. 55-57		Journal
7	Geometrical Analysis of Architecture of Ellora Caves	Dr. S .N. Bidarkar	Febr uary- 2020	<u>Online</u> <u>Research</u> <u>Journal Our</u> <u>Heritage</u> <u>Journal,</u> February-2020 Volume 68Special Issue 2 Page No. 206- 208	ISSN : 0474- 9030	UGC CARE LISTED and peer- reviewed open access Journal
8	Innovation and Pedagogy in Higher Education Imparting Sustainable Quality Education through SWAYAM	Dr. S .N. Bidarkar	Febr uary- 2020	<u>Online</u> <u>Research</u> <u>Journal Our</u> <u>Heritage</u> <u>Journal,</u> February-2020 Volume 5Special Issue 2 Page No. 315- 318	ISSN : 0474- 9030	UGC CARE LISTED and peer- reviewed open access Journal
9	Beck's conjecture and multiplicative lattices	Vinayak Joshi, Sachin Sarode	2015	Discrete Mathematics Volume 338, Issue 3, 6 March 2015, Pages 93-98	0012-365X	International , Impact Factor: 0.5, Scopus Indexed
10	Diameter and girth of the multiplicative zero-divisor graph of multiplicative lattices	Vinayak Joshi, Sachin Sarode	2016	Asian- European Journal of Mathematics Vol. 09, No. 04, 1650071 (2016)	Print ISSN: 1793-5571 Online ISSN: 1793-7183	International, Scopus Indexed

11	Advantages of Digital Payment system In India	Sachin Sarode	2019	Aayushi International Interdisciplinar y Research Journal Vol. 1, 193-195	2349-638x	International
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12) Number of books and chapter in edited volumes / Books published

Sr. No.	Name of Faculty	Title of the book/ chapter published	National/ International	Year of publication	ISBN/ISSN No.	Name of the publisher
1	Dr. S. N. Bidarkar	Great Indian Mathematician and Their Contribution	National	2021	978-81- 949113-9-5	Knowledge World Publication
2	Dr. S. V. Sarode	Great Indian Mathematician and Their Contribution D. R. Kaprekar: Journey of Giant from School teacher to Recreational Mathematician	National	2021	978-81- 949113-9-5	Knowledge World Publication
3	Dr. S. V. Sarode	Number Theory	National	2021	978-93- 91204-22-8	Anand Prakashan

13) Details of research guides

Sr. No.	Name of research guide	Date of Approval as research guide
1	Dr. S. N. Bidarkar	2020

14) Number Seminar / Workshop / Conference Attended / presented a paper

Sr. No	Name of faculty	International	National	Total	
1	Dr. S. N. Bidarkar	3	6	09	
2	Dr. S. V. Sarode	6	20	26	

15) Details of Infrastructural facilities:

Library	:	Central library facility.
Internet Facilities for staff & students	:	Yes
Class room with ICT facility	:	Yes

16) Details on the students enrichment programs (special lecture, workshops, and seminar) with external experts: (2016-17 to 2021-22)

Sr. No	Title of Workshop/	Name of	Date of event
	seminar/ Guest lecture	recourse person	
1	Use of Mathematics in	Dr. V. B.	01/06/2021
	various Scripture	Kulkarni	
2	Integration of Trigonometric	Dr. A. S.	02/06/2021
	Functions	Kausadikar	
3	Preliminary concept of	Dr. Sandip Patil	03/06/2021
	Algebra	-	
4	Numerical Methods	Dr. C. D. Belle	04/06/2021
5	Number Theory	Dr. Anil Chinde	05/06/2021
6	Online Workshop on	Dr. Anil	01/06/2021
	Research Methodology in	Khairnar	
	Mathematics	Dr. Deepak	
		Pachpatte	
		Dr. Sachin	
		Bhalekar	

17) Details of Teaching- Learning methods / E-content

Sr. No.	Name of Faculty	Teaching Methods
1	Dr. S. N. Bidarkar	You Tube channel
2	Dr. S. V. Sarode	You Tube channel

18) Teaching methods adopted to improve student learning-

- Power Point Presentations
- Use of Video Clips
- Video Conferencing Lecture
- Organized Workshop
- Online NPTEL Courses
- Online NPTEL/UGC-SWAYAM Lectures
- Students Seminar

19) Event's with Photographs



Celebration of National Year of Mathematics 2018



Poster Presentation by Student on the Occasion of National Year of Mathematics 2018



Demonstration of Mathematics to school students



Student explaining her poster during Poster Presentation



Student explaining his poster to school Students.



Students participated in Poster Presentation.

National Webinar on

Application of Algebra and Analysis

(Sunday, 14th June 2020)



1. Professor Vinayak Joshi giving his presentation



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2. Dr. Anant Hariharan giving his presentation



3. Dr. Arun Patil giving his presentation



4. Dr. Kishor Kucche giving his presentation



5. Dr. B.R. Sontakke giving his concluding remarks



Five Days Online Student Development Program "Ramanujan Lecture Series" (1st June to 5th June 2021)



Day: 1 Dr. V. B. Kulkarni giving his presentation





Day: 2 Dr. A. S. Kausadikar giving his presentation







Day: 3 Dr. Sandeep D. Patil giving his presentation





Day: 4 Dr. C. D. Bele giving his presentation



Day: 5 Dr. Anil D. Chindhe he giving his presentation







"One Day Online Workshop on Research Methodology in Mathematics" (20th July 2021)



Inaugural Speech: Dr. B.R. Sontakke



Session: 1 Dr. Anil Khairnar giving his presentation





Session: 2 Dr. D. B. Pachpatte giving his presentation





Session: 3 Dr. Sachin Bhalekar giving his presentation



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Valedictory Speech: Dr. R. N. Ingle



20) SWOC analysis of the department and Future Plans:

a) SWOC analysis:

Strengths: The major strength of the Department of Mathematics is the quality of the faculty. All faculty members are well qualified and completed PhD. Faculty has strong and established research programs with strengths in the areas of Differential equation and discrete mathematics. Faculty has their research programs supported by grants from external agencies; these included. Babasaheb Ambedkar Marathwada University and UGC.

Weakness: The weakness of the Department of Mathematics is department does not run any PG course. Very less Mathematics books in the college library.

Opportunities: There are many opportunity in front of Department of Mathematics. In future Department can start PG Courses. Department may be recognize as research center by the university as Faculty have strong and established research programs with strengths in the areas of Differential equation and discrete mathematics and their research programs supported by grants from external agencies; these include UGC.

Challenges: Challenge of Mathematics Department is to start PG Course, Research Centre. Increase the Mathematics books in the college library.

b) Future plan:

- 1) To start PG and Research Centre in Mathematics.
- 2) Submission of proposal for Organization of National and International Level Conference

Fred

Head Department of Mathematics