

Rayat Shikshan Sanstha's

D. P. Bhosale College, Koregaon

Department of Mathematics

Add on Course in

Combinatorics

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Department of Mathematics

Add on Course in
Combinatorics

Report

As the department always strives for the best, taking into consideration the need of the computer and job opportunity Department of Mathematics ran the Add on Course entitled '**Combinatorics**' in academic year 2018-19.

The department has designed this course. It has its own Board of Studies (BoS). All the faculty members took active participation in running the said course. The course started from December 2018 and completed at March 2019. The 08 students enrolled to this course. The examination was conducted on 12th March, 2019.

The present faculty of the Department teaches this course as well. In addition to it the exam is taken and the certificates are issued to the students. Students are benefitted through this course.

| Sr. No. | Year | No. of beneficiary students |
|---------|---------|-----------------------------|
| 1 | 2018-19 | 08 |

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Objectives and Outcome of the course

Objectives of the course:

- 1) To carry over an apply knowledge from combinatorics and previous proof based course.
- 2) To present clear and detailed solutions to assigned problems.
- 3) To read and understand assigned sections of the book.
- 4) To use algorithms to study properties of graph .
- 5) To study a new combinatorial topics.

Outcome of the course:

- 1) Select and justify appropriate tools to analyze a counting problem.
- 2) To analyze a methods to compute one efficiently.
- 3) To prove combinatorial identities by counting a set of objects in two ways.
- 4) Construct counting problems which show the usefulness or limitations of combinatorial tools.

Reference Books:

- 1) Discrete and Combinatorial mathematics- An applied introduction by R.P.Grimaldi, B.V.Ramana
- 2) A Course in Combinatorics by J.H.Vanlint, R.M.Wilson

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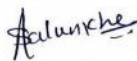
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**Add on Course in
Combinatorics**

Course Particulars

1. Eligibility : XII std. pass.
2. Duration of Course : 3 Months.
3. No. of Students : 08
4. Examination : Written Exam (50 marks)
5. Faculty : 1. Mrs.A.S.Salunkhe (Co-ordinator)
2. Miss. S.G. Mane
6. Coordinator : Head, Dept. of Mathematics
D.P. Bhosale College, Koregaon.
7. Board of Studies : 1. Mrs.Salunkhe A.S. (Co-ordinator)
2. Dr. Yadav J.D. (S.G.M.College, Karad)
3. Mr. Patil S .A. (S.G.M.College, Karad)
8. Experts Name : 1. Dr.Yadav J.D. (S.G.M. College, Karad)
2. Mr. Patil S.A. (S.G.M. College, Karad)



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**Add on Course in
Combinatorics**

Syllabus

| Sr.No. | Unit | Theory | Practical | Total period |
|--------|--|--------|-----------|--------------|
| 1. | Properties of binomial coefficients: The recursion, The binomial theorem and its applications, combinatorial identities: Bisections and catalan numbers, additional problems | 04 | 02 | 06 |
| 2. | The principle of inclusion and exclusion: A simple examples, the general formula, applications, additional problems | 03 | 02 | 05 |
| 3. | Enumeration by means of recursions: A first examples, finding linear recursions, generating functions, problems, | 03 | 02 | 05 |
| 4. | The pigeonhole principle: The principle and first examples, various applications and its problems | 03 | 02 | 05 |
| 5. | Potential functions and invariants: Invariants, potential functions and its examples. | 03 | 02 | 05 |
| 6. | Some concepts in graph theory: Definitions, eulerian and Hamiltonian cycles, plane graphs and | 02 | 02 | 04 |

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Add on Course in

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Notice

Date:26/11/2018

All students of B.Sc. III (Mathematics) are here by informed that Department of Mathematics going to organize your add on course '**Combinatorics**' has been scheduled from 1st December 2018 to March 2019. Remain present at prescribed time in lecture hall.



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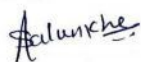
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Combinatorics**

Time Table (Dec.2018 to Mar.2019)

| TIME | MON. | TUE. | WED. | THU. | FRI. | SAT. |
|--------------------|------|------|-------|-------|--------|--------|
| 10.30-11.20 a.m. | | | ----- | ----- | S.A.S. | S.G.M. |
| 03.30 – 04.30 p.m. | | | ----- | ----- | S.G.M. | D.P.G |

1. S.A.S. - Mrs. Salunkhe A.S.
2. S.G.M - Miss. Mane S.G.
3. D.P.G. - Mr. Gawade D. P.



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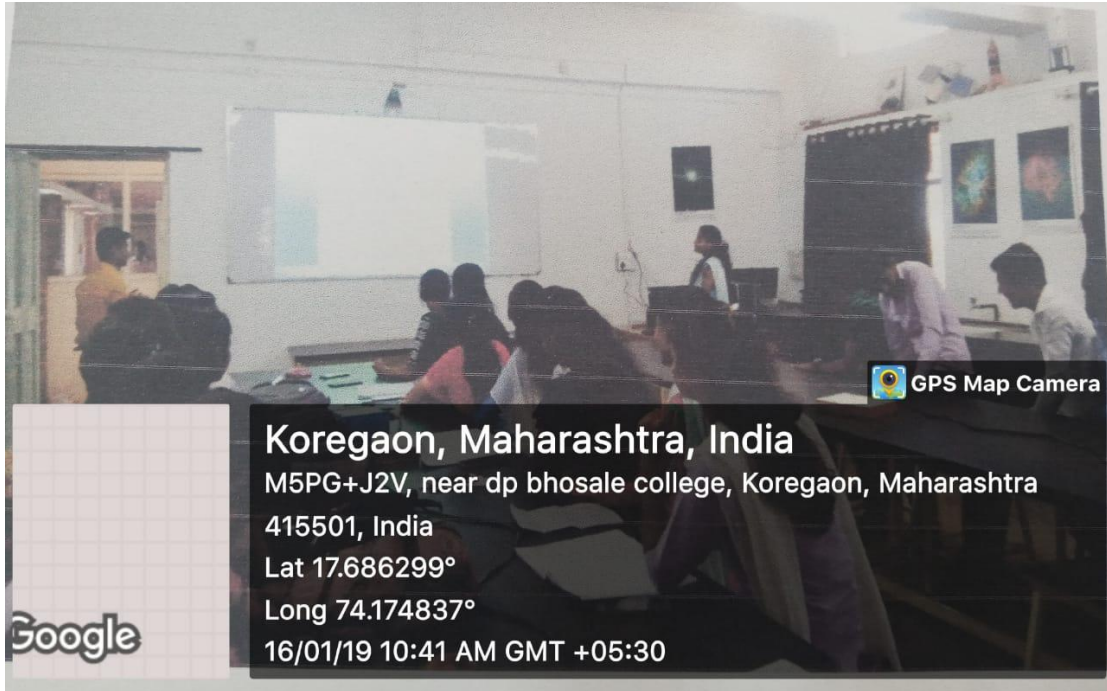
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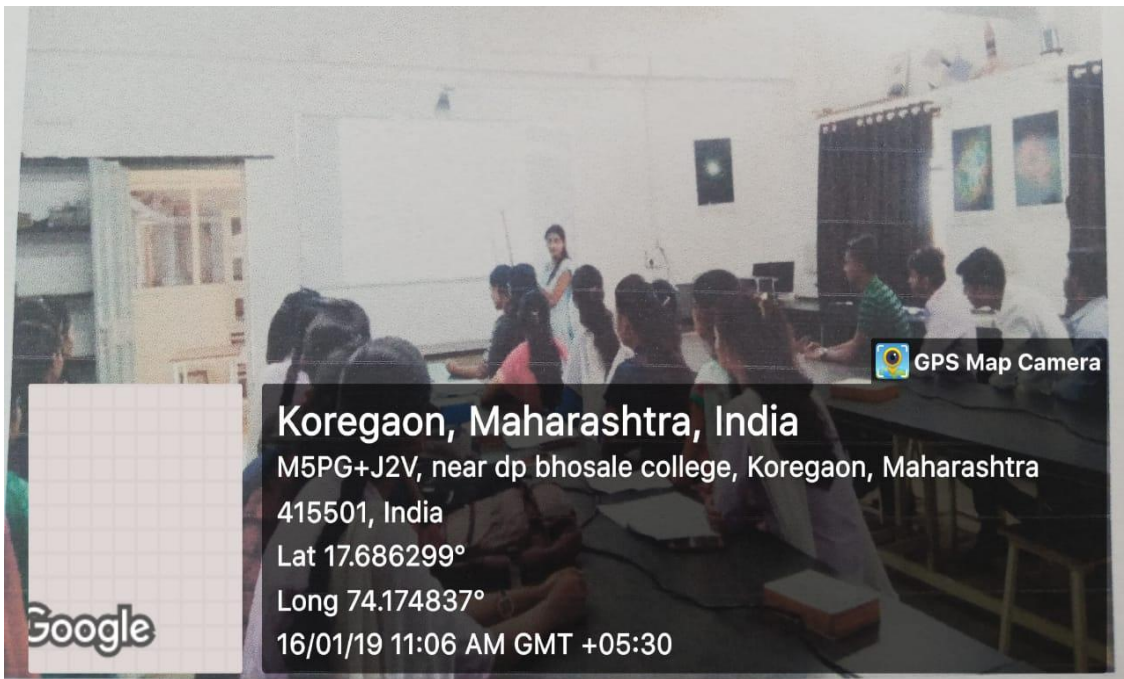
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Miss. Mane S.G. Delivered a lecture on Combinatorics dated 16/01/2019



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Add on Course in
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List of the Student

| Sr. No. | Name of the Students |
|---------|-------------------------|
| 1 | Bhagwat Shilpa Sudhakar |
| 2 | Chavan Priyanka Vishnu |
| 3 | Chavan Trupti Dipak |
| 4 | Chinake Ashwini Kishor |
| 5 | Kadam Nikita Lakshman |
| 6 | Pawar Sonal Dilip |
| 7 | Pawar Swarupa Rajendra |
| 8 | Zanjurne Sampada Mohan |



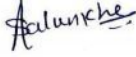
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Combinatorics

Examination Notice

Students of add on course of 'Combinatorics' are hereby informed that their examination will be conducted in month of 12th March 2019. The Dates and time table are as follows.

| Course | Date | Time |
|---------------|------------|-------------------------|
| Combinatorics | 12/03/2019 | 12.00 a.m. to 2.00 p.m. |


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Add on Course in
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Date- 12/03/2019

Time-12 to 1pm

Marks-

50

Intructions:1)All questions are compulsory and equal marks

2)Figures to write indicate full marks.

Q.1) Choose the correct alternative from the following :

(10)

1) If A.M. of 6,7,9,x is 10, then the value of x is

- a) 20 b) 18 c) 22 d) 24

2) the sum of first five multiples of 3 is.....

- a) 45 b) 55 c) 65 d) 75

3) find the value of combination C_4^{12}

- a) 459 b) 455 c) 495 d) 485

4) give the recurrence relation $f(n) = (n-1) + f(n-1), n > 2, f(2) = 1$, then $f(n)$ is :

- a) $\frac{3n(n-1)}{2}$ b) $\frac{n(n+1)}{2}$ c) $\frac{n(n-1)}{2}$ d) $\frac{3n(n+1)}{2}$

5) how many four letter word can be formed out of the word "PINEAPPLES"?

- a) 840 b) 5040 c) 720 d) 5120

6) For the curve $xy^3 - yx^3 = 6$, the slope of tangent line at the point (1,-1) is

- a) 1/2 b) -1 c) 2 d) 1

7) let G be an undirected complete graph on n vertices, where $n > 2$. Then, the number of different Hamiltonian cycles in G is equal to

- a) $n!$ b) $(n-1)!$ c) 1 d) $\frac{(n-1)!}{2}$

8) the maximum number of edges in a bipartite graph on 12 vertices is

- a) 25 b) 33 c) 36 d) 49

9)..... of graph is a vertex whose removal disconnects graph.

- a) terminal vertex b) start vertex c) cut vertex d) middle vertex

10) the approximate value of $y(0.1)$ from $dy/dx = x^2y - 1, y(0) = 1$ is

- a) 0.900 b) 1.001 c) 0.802 d) 0.994

Q.2) Give the one application of pigeonhole principle by stating and proving strong form of the pigeon hole principle

(10)

OR

Q.2) Prove the general formula for the inclusion and exclusion .

Q.3) State and prove the binomial theorem **(10)**

OR

Q.3) Derive formula for D_n and show that $\sum_{k=1}^n k(n-1)$

Q.4) Define Hamiltonian cycle. and find the sum of all coefficients in **(10)**

$$(-3x + y - 4z)^4$$

OR

Q.4) Define D_n , derangement of n objects. Use combinatorial technique to show that $D_n = n! (1 - \frac{1}{1!} + \frac{1}{2!} - \frac{1}{3!} + \dots + (-1)^n \frac{1}{n!})$, $n \geq 1$. Hence find D_5

Q.5) Define and solve the recurrence relation $a_n = 5a_{n-1} - 6a_{n-2}$ **(10)**

subject to the initial condition $a_0 = 1$ and $a_1 = -2$; $n \geq 2$.

OR

Q.5) Define catalan number. Find the numbers of non-negative integer solution of $x + y + z + w = 10$.

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Marksheet

| Sr. No | Name of Student | Total out of 50 | Grade |
|--------|-------------------------|-----------------|-------|
| 1 | Bhagwat Shilpa Sudhakar | 36 | A |
| 2 | Chavan Priyanka Vishnu | 28 | B |
| 3 | Chavan Trupti Dipak | 42 | A+ |
| 4 | Chinake Ashwini Kishor | 42 | A+ |
| 5 | Kadam Nikita Lakshman | 34 | A |
| 6 | Pawar Sonal Dilip | 45 | A+ |
| 7 | Pawar Swarupa Rajendra | 39 | A |
| 8 | Zanjurne Sampada Mohan | 35 | A |

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Add on Course in
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(Dec.2018 to Mar.2019)

Attendance

| Sr. No. | Roll No. | Name of the Student | 4/12/2018 | 5/12/2018 | 11/12/2018 | 12/12/2018 | 28/12/2018 |
|---------|----------|-------------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| 1 | 2926 | Bhagwat Shilpa Sudhakar | <u>Bhagwat</u> | | <u>Bhagwat</u> | <u>Bhagwat</u> | <u>Bhagwat</u> |
| 2 | 2927 | Chavan Priyanka Vishnu | <u>P.V.Chavan</u> | <u>P.V.Chavan</u> | <u>P.V.Chavan</u> | | <u>P.V.Chavan</u> |
| 3 | 2928 | Chavan Trupti Dipak | <u>Chavan</u> | <u>Chavan</u> | <u>Chavan</u> | <u>Chavan</u> | <u>Chavan</u> |
| 4 | 2929 | Chinake Ashwini Kishor | <u>A.K.Chinake</u> | <u>A.K.Chinake</u> | <u>A.K.Chinake</u> | <u>A.K.Chinake</u> | <u>A.K.Chinake</u> |
| 5 | 2930 | Kadam Nikita Lakshman | <u>K.N.L</u> | <u>K.N.L</u> | <u>K.N.L</u> | | <u>K.N.L</u> |
| 6 | 2931 | Pawar Sonal Dilip | <u>Pawar.S.D</u> | <u>Pawar.S.D</u> | | <u>Pawar.S.D</u> | <u>Pawar.S.D</u> |
| 7 | 2932 | Pawar Swarupa Rajendra | <u>Pawar</u> | <u>Pawar</u> | <u>Pawar</u> | <u>Pawar</u> | |
| 8 | 2933 | Zanjurne Sampada Mohan | <u>Zanjurne</u> | <u>Zanjurne</u> | <u>Zanjurne</u> | <u>Zanjurne</u> | <u>Zanjurne</u> |

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(Dec.2018 to Mar.2019)

Attendance

| Sr. No. | Roll No. | Name of the Student | 1/01/2019 | 2/01/2019 | 3/01/2019 | 9/01/2019 | 15/01/2019 |
|---------|----------|-------------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| 1 | 2926 | Bhagwat Shilpa Sudhakar | <u>Bhagwat</u> | <u>Bhagwat</u> | <u>Bhagwat</u> | <u>Bhagwat</u> | <u>Bhagwat</u> |
| 2 | 2927 | Chavan Priyanka Vishnu | <u>P.V.Chavan</u> | <u>P.V.Chavan</u> | | <u>P.V.Chavan</u> | <u>P.V.Chavan</u> |
| 3 | 2928 | Chavan Trupti Dipak | <u>Chavan</u> | <u>Chavan</u> | <u>Chavan</u> | | <u>Chavan</u> |
| 4 | 2929 | Chinake Ashwini Kishor | <u>A.K.Chinake</u> | <u>A.K.Chinake</u> | <u>A.K.Chinake</u> | <u>A.K.Chinake</u> | <u>A.K.Chinake</u> |
| 5 | 2930 | Kadam Nikita Lakshman | <u>K.N.L</u> | <u>K.N.L</u> | <u>K.N.L</u> | <u>K.N.L</u> | |
| 6 | 2931 | Pawar Sonal Dilip | <u>Pawar S.D</u> | <u>Pawar S.D</u> | <u>Pawar S.D</u> | | |
| 7 | 2932 | Pawar Swarupa Rajendra | <u>Pawar</u> | <u>Pawar</u> | <u>Pawar</u> | <u>Pawar</u> | <u>Pawar</u> |
| 8 | 2933 | Zanjurne Sampada Mohan | <u>Zanjurne</u> | <u>Zanjurne</u> | <u>Zanjurne</u> | <u>Zanjurne</u> | |



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(Dec.2018 to Mar.2019)

Attendance

| Sr. No. | Roll No. | Name of the Student | 16/01/2019 | 22/01/2019 | 29/01/2019 | 29/01/2019 | 30/01/2019 |
|---------|----------|-------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| 1 | 2926 | Bhagwat Shilpa Sudhakar | <u>Bhagwat</u> | | <u>Bhagwat</u> | <u>Bhagwat</u> | <u>Bhagwat</u> |
| 2 | 2927 | Chavan Priyanka Vishnu | <u>P.V.chavan</u> | <u>P.V.chavan</u> | <u>P.V.chavan</u> | <u>P.V.chavan</u> | <u>P.V.chavan</u> |
| 3 | 2928 | Chavan Trupti Dipak | <u>Chavan</u> | | <u>Chavan</u> | <u>Chavan</u> | <u>Chavan</u> |
| 4 | 2929 | Chinake Ashwini Kishor | <u>A.chinake</u> | <u>A.chinake</u> | <u>A.chinake</u> | <u>A.chinake</u> | <u>A.chinake</u> |
| 5 | 2930 | Kadam Nikita Lakshman | <u>K.N.L</u> | <u>K.N.L</u> | <u>K.N.L</u> | | <u>K.N.L</u> |
| 6 | 2931 | Pawar Sonal Dilip | | <u>Pawar.S.D</u> | <u>PawarSD</u> | <u>PawarSD</u> | <u>PawarSD</u> |
| 7 | 2932 | Pawar Swarupa Rajendra | <u>Pawar</u> | <u>Pawar</u> | <u>Pawar</u> | <u>Pawar</u> | <u>Pawar</u> |
| 8 | 2933 | Zanjurne Sampada Mohan | | <u>Zanjurne</u> | <u>Zanjurne</u> | <u>Zanjurne</u> | <u>Zanjurne</u> |



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(Dec.2018 to Mar.2019)

Attendance

| Sr. No. | Roll No. | Name of the Student | 5/02/2019 | 6/02/2019 | 12/02/2019 | 19/02/2019 | 19/02/2019 |
|---------|----------|-------------------------|-------------------|------------------|-------------------|-------------------|-------------------|
| 1 | 2926 | Bhagwat Shilpa Sudhakar | <u>Bhagwat</u> | <u>Bhagwat</u> | <u>Bhagwat</u> | <u>Bhagwat</u> | <u>Bhagwat</u> |
| 2 | 2927 | Chavan Priyanka Vishnu | <u>P.V.chavan</u> | | <u>P.V.chavan</u> | <u>P.V.chavan</u> | <u>P.V.chavan</u> |
| 3 | 2928 | Chavan Trupti Dipak | <u>Chavan</u> | <u>Chavan</u> | <u>Chavan</u> | <u>Chavan</u> | |
| 4 | 2929 | Chinake Ashwini Kishor | <u>Achirake</u> | <u>Achirake</u> | <u>Achirake</u> | <u>Achirake</u> | <u>Achirake</u> |
| 5 | 2930 | Kadam Nikita Lakshman | <u>K.N.L</u> | <u>K.N.L</u> | <u>K.N.L</u> | <u>K.N.L</u> | <u>K.N.L</u> |
| 6 | 2931 | Pawar SonalDilip | <u>Pawar S.D</u> | <u>Pawar S.D</u> | | <u>Pawar S.D</u> | |
| 7 | 2932 | Pawar Swarupa Rajendra | | <u>Pawar</u> | <u>Pawar</u> | <u>Pawar</u> | <u>Pawar</u> |
| 8 | 2933 | ZanjurneSampada Mohan | <u>Zanjurne</u> | | <u>Zanjurne</u> | <u>Zanjurne</u> | <u>Zanjurne</u> |



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(Dec.2018 to Mar.2019)

Attendance

| Sr. No. | Roll No. | Name of the Student | 20/02/2019 | 26/02/2019 | 27/02/2019 | 5/03/2019 | 5/03/2019 |
|---------|----------|-------------------------|------------------------|------------------------|-------------------|------------------------|------------------------|
| 1 | 2926 | Bhagwat Shilpa Sudhakar | <u>Bhagwat</u> | <u>Bhagwat</u> | <u>Bhagwat</u> | <u>Bhagwat</u> | <u>Bhagwat</u> |
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| 6 | 2931 | Pawar Sonal Dilip | <u>Pawar S.D</u> | <u>Pawar S.D</u> | <u>Pawar S.D</u> | <u>Pawar S.D</u> | |
| 7 | 2932 | Pawar Swarupa Rajendra | <u>Pawar</u> | <u>Pawar</u> | | <u>Pawar</u> | <u>Pawar</u> |
| 8 | 2933 | Zanjurne Sampada Mohan | <u>Zanjurne</u> | <u>Zanjurne</u> | <u>Zanjurne</u> | <u>Zanjurne</u> | <u>Zanjurne</u> |



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D. P. BHOSALE COLLEGE, KOREGAON

ADD-ON COURSE

Certificate

This is to certify that Mr./Miss.....

CLASS :SUBJECT.....

has successfully completed three months

"Add-On Course" in *Combinatorics*

From *Dec-2018*..... to *March 2019*..... and obtained Grade.


Chairman


Course Co-ordinator


Principal