

GOVERNMENT DEGREE COLLEGE

MUMMIDIVARAM – 533 216

**Dr.B.R.AMBEDKAR KONASEEMA DISTRICT,
ANDHRA PRADESH**



Guest Lecture

on

**“Applications of Differential Equations in
Various Fields”**

Resource Person

**S.Lt Dr.D.CH.Paparao,
H.O.D, Department of Mathematics,
V.K.V.Govt Degree College, Kothapeta.**

Date : 30 -09-2024

Organized By

**Department of Mathematics,
Govt. Degree College, Mummdivaram
Dr.B.R.Ambedkar Konaseema District**

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**GOVERNMENT DEGREE
COLLEGE
MUMMIDIVARAM
Dr.B.R.Ambedkar
Konaseema District-533216**



DEPARTMENT OF MATHEMATICS

Date : 23-09-2024

The Department of Mathematics is resolved to conduct a Guest Lecture on "Applications of Mathematics in Various Fields" on 30-09-2024 at 10 AM for all the mathematics students in the Seminar Hall (Room No.5).

Guest Lecture Topic : Applications of Mathematics in Various Fields

Resource Person : S. Lt. Dr. D. CH. Paparao, Senior Lecturer, H. O. D. Of Mathematics, V. K. V. GDC, Kothapeta

Date : 30-09-2024

Time : 10 AM

Venue : Seminar Hall (Room No.5)

The objectives of the Guest Lecture:

1. To help students in latest concepts, practices, trends etc in Mathematics
2. To facilitate effective achievement of certain course outcomes
3. To enhance subject knowledge for students.
4. To suggest suitable measures for academicians.
5. To gain specialized knowledge, diverse perspectives, and connections that can significantly improve their educational journey and future career prospects


Signature of the Lecturer in charge

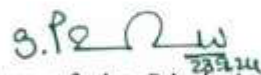
K.CHITTIBABU

M.Sc. CSIR-JRF, NET

**Lecturer in Charge
Department of Mathematics
Govt. Degree College**

MUMMIDIVARAM - 533216

Dr. B.R. Ambedkar Konaseema Dist, A.P.


Signature of the Principal

**PRINCIPAL
GOVERNMENT DEGREE COLLEGE
MUMMIDIVARAM - 533 216
Dr. B.R. Ambedkar Konaseema Dt. A.P**



**GOVERNMENT DEGREE
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MUMMIDIVARAM
Dr.B.R.Ambedkar
Konaseema District-533216**



DEPARTMENT OF MATHEMATICS

Date: 25-09-2024

From,
K. Chittibabu, M.Sc., CSIR-JRF., NET.,
Lecturer in charge,
Department of Mathematics,
Mummidivaram-533216
Dr.B.R.Ambedkar Konaseema District.

To
The Principal,
Govt Degree College,
Mummidivaram-533216,
Dr.B.R.Ambedkar Konaseema District

Sir,

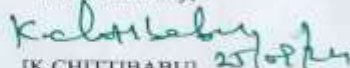
SUB: Sri K.Chittibabu, Lecturer-in-charge, Department of Mathematics, Govt. Degree College, Mummidivaram-Request you to give permission to organize a Guest lecture on "Applications of Differential Equations in Various fields" on 30-09-2024- Req- Regarding.

@@@

I wish to submit the Department of Mathematics is going to conduct an Extension Lecture on "Applications of Differential Equations in Various fields" on 30-09-2024 at 10 AM. In this connection I would like to invite Dr.D.CH.Paparao, Senior Lecturer, Department of Mathematics, V.K.V.Degree College, Kothapeta as resource person. Hence, I request you sir kindly give me permission to organize a Guest lecture on 30-09-2024. For this I ever thankful to you sir.

Thanking you Sir,

70
15
25/9/24

Yours Faithfully,

[K CHITTIBABU]
Lecturer in charge,
Department of Mathematics
Mummidivaram

Station : Mummidivaram
Date : 25-09-2024

Estb: 2021
Mail: gdcummdivaram.jke@gmail.com

Office : 088562 93784
Principal: 9866668182



GOVERNMENT DEGREE COLLEGE,
MUMMIDIVARAM
Dr.B.R. AMBEDKAR KONASEEMA
DISTRICT- 533216



Dr.S.PRABHAKAR M.A., Ph.D
Principal

Mummidivaram,
Dt: 26-09-2024

To
The Principal,
V.K.V.Govt. Degree College,
Kothapeta.

Sir

Sub: - Request to depute Dr.D.CH.Paparao, Senior Lecturer, Department of Mathematics to deliver extension lecture on 30-09-2024 in Connection with extension activity -Req-Reg.

Ref: - Request letter received from the Department of Mathematics of Our College Dated on 25-09-2024.

@@@

I Wish to submit that as per the reference cited above the Department of Mathematics of our college is going to conduct an Extension Lecture on 30-09-2024. So, I request you to depute **Dr.D.CH.Paparao, Senior Lecturer, Department of Mathematics**, to deliver extension lecture on "**Applications of Differential Equations in Various Fields**" on 30.09.2024 at 10 AM. Hence kindly permit him to attend the extension lecture for which I shall ever be thankful to you.

Thanking you,

Yours faithfully,

Copy to Dr.D.CH.Paparao,
Senior Lecturer,
Department of Mathematics,
V.K.V.Govt Degree College,
Kothapeta.


PRINCIPAL 26.9.24
GOVERNMENT DEGREE COLLEGE
MUMMIDIVARAM - 533 216
Dr.B.R. Ambedkar Konaseema Dt. A.P.


26/9/24



**GOVERNMENT DEGREE
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MUMMIDIVARAM
Dr.B.R.Ambedkar
Konaseema District-533216**



DEPARTMENT OF MATHEMATICS

Date: 27-09-2024

ACCEPTANCE LETTER

**DATE: 27.09.2024
PLACE: KOTHAPETA**

FROM:
Dr.D.CH.PAPARAO
HOD OF MATHEMATICS
V.K.V.GOV.T.DEGREE COLLEGE, KOTHAPETA

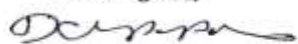
TO
THE PRINCIPAL
GOVT.DEGREE COLLEGE,
MUMMIDIVARAM

Respect Sir,

SUB: "Acceptance of your Invitation to deliver a guest lecture"-regarding

I am pleased to accept your invitation to deliver a guest lecture on "Applications of Differential Equations in various fields" at Government Degree College, MUMMIDIVARAM on 30.09.2024 at 10.30am. It is an honour to be considered for this opportunity, and I am excited to share my insights and experiences with your students. Looking forward to a productive session with your bright students.

Best regards,


(Dr.D.CH.PAPARAO) 27/09/2024



**GOVERNMENT DEGREE
COLLEGE
MUMMIDIWARAM
Dr.B.R.Ambedkar
Konaseema District -533216**



DEPARTMENT OF MATHEMATICS

Date : 28-09-2024

NOTICE

It is here by informed to all the III B.Sc(M.P.Cs), I B.Sc Chemistry honors and Computer Science honors students of that the **Department of Mathematics** is going to conduct a Guest Lecture on "**Applications of Mathematics in Various Fields**" on 30-09-2024 at 10 AM. Hence all the students are instructed to attend the above said Programme without fail.

Guest Lecture Topic : Applications of Mathematics in Various Fields

Resource Person : S. Lt. Dr. D. CH. Paparao, Senior Lecturer, H. O. D. Of Mathematics, V. K. V. GDC, Kothapeta
Date : 30-09-2024
Time : 10 AM
Venue : Seminar Hall (Room No.5)


Signature of the Lecturer in charge

K.CHITTIBABU
M.Sc, CSIR-JRF, NET
Lecturer in Incharge
Department of Mathematics
Govt. Degree College
MUMMIDIWARAM - 533216
Dr.B.R.Ambedkar Konaseema Dist, A.P.


Signature of the Principal

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**GOVERNMENT DEGREE
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MUMMIDIYARAM
Dr.B.R.Ambedkar
Konaseema District- 533216**



DEPARTMENT OF MATHEMATICS

Date:28-09-2024

S.No	Name of the student	Class	Group	Roll No	Signature of the student
1.	D. Mahalakshmi	III BSC	MPCS	04	D. Mahalakshmi
2.	Ch. Navya	III BSC	MPCS	03	Ch. Navya
3.	K. Kushi Deepika	III rd BSC	MPCS	07	K. Kushi Deepika
4.	U. Anitha	III rd BSC	MPCS	17	U. Anitha
5.	Ch. Vijaya Sri Lakshmi	III rd BSC	MPCS	02	Ch. Vijaya Sri Lakshmi
6.	S. Durga Lakshmi	III rd BSC	MPCS	15	S. Durga Lakshmi
7.	P. Bhuvana	III rd BSC	MPCS	13	P. Bhuvana
8.	P. Sravanthi	III rd BSC	MPCS	12	P. Sravanthi
9.	L. Prameela	III rd BSC	MPCS	09	L. Prameela
10.	K. Haritha	III rd B.S.C	MPCS	08	K. Haritha
11.	V. Vannu prasanna	III rd B.S.C	MPCS	18	V. Vannu prasanna
12.	G. Manika	III rd BSC	mPCS	05	G. Manika
13.	J.V.S.S. Surekha	I st BSC	computers	02	J.V.S.S. Surekha
14.	K. Pavan Lakshmi	1 st BSC	computers	03	K. Pavan
15.	Barasadi Bhargavi Lakshmi	I BSC	chemistry	02	B.B. Lakshmi



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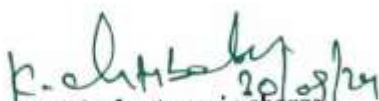


DEPARTMENT OF MATHEMATICS

Date:30-09-2024

PROGRAMME SHEET

Inviting Guests to the dais	: Sri D.Pallamraju, Lecturer in Chemistry
1.Prayer	: 1) Kumari D.Mahalakshmi, III B.Sc (M.P.Cs) 2) Kumari T.Sowjanya, III B.Sc (M.P.Cs)
2. Principal's Opening Remarks	: Dr.S.Prabhakar, Principal
3. Introduction of the Resource Person	: Dr.G.Sujatha, Lecturer in English
4. Guest Lecture by Resource Person	: S.Lt Dr.D.CH.Paparaao, H.O.D, Department of Mathematics, V.K.V.GDC, Kothapeta.
5. Feedback by Students	: 1) Kumari L.Prameela, III B.Sc (M.P.Cs)
6. Felicitation to the Resource Person	: Principal, Staff & Students
7. Vote of Thanks	: Sri K.Chittibabu, Lecturer in Mathematics
8. National Anthem	: By All the Participants


Signature of the Lecturer in charge
K.CHITTIBABU

M.Sc, CSIR-JRF, NET
Lecturer in Incharge
Department of Mathematics
Govt. Degree College
MUMMIDIVARAM - 533216
Dr.B.R.Ambedkar Konaseema Dist, A.P.


Signature of the Principal
PRINCIPAL
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Dr.B.R. Ambedkar Konaseema Dt. A.P.



**GOVERNMENT DEGREE
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Dr.B.R.Ambedkar
Konaseema District-533216**



DEPARTMENT OF MATHEMATICS

Date: 30-09-2024

TOPIC SYNOPSIS

Differential Equation applications have significance in both academic and real life. An equation denotes the relation between two quantity or two functions or two variables or set of variables. Differential equation denotes the relationship between a function and its derivatives, with some set of formulas. There are many examples, which signifies the use of these equations.

The functions are the one which denotes some sort of operation performed and the rate of change during the performance is the derivative of that operation, and the relation between them is the differential equation. These equations are represented in the form of order of the degree, such as first order, second order, etc. Its applications are common to find in the field of engineering, physics etc.

Differential Equations

In terms of mathematics, we say that the differential equation is the relationship that involves the derivative of a function or a dependent variable with respect to an independent variable. It is represented as;

$$\frac{d(y)}{d(x)} = f(x) = y^1 \quad \text{OR} \quad \frac{d(y)}{d(x)} = f(x, y) = y^1$$

Where, x is independent and y is dependent variable.

Equation $f(x, y, c) = 0$. **Example:** $2x + 3y + 5 = 0$

Differential equation of 1st order $\Rightarrow F(x, y, y^1) = 0$

Example: $\frac{dy}{dx} = x + y$

Differential equation of 2nd order $\Rightarrow F(x, y, y^1, y^{11}) = 0$.

Example: $\frac{d^2y}{dx^2} + 2 \frac{dy}{dx} + 3y = 4x^3$

Differential equation of 3rd order $\Rightarrow F(x, y, y^1, y^{11}, \dots, y^n) = 0$

Example: $\frac{d^3y}{dx^3} + 3 \frac{d^2y}{dx^2} + 5 \frac{dy}{dx} + 2y = e^x$

Differential equation of nth order $\Rightarrow F(x, y, y^1, y^{11}, \dots, y^n) = 0$

$\Rightarrow \frac{d^ny}{dx^n} + p_1 \frac{d^{n-1}y}{dx^{n-1}} + p_2 \frac{d^{n-2}y}{dx^{n-2}} + p_3 \frac{d^{n-3}y}{dx^{n-3}} + \dots + p_n y = \sin x$

Ordinary Differential Equation(ODE)

Ordinary differential equation involves a relation between one real variable which is independent say x and one dependent variable say y.

Example: $\frac{dy}{dx} = x^3, y = f(x)$

Partial Differential Equation(PDE)

In the partial differential equation, unlike ordinary differential equation, there is more than one independent variable.

Example: $\frac{\partial z}{\partial x} + \frac{\partial z}{\partial y} = 2z \quad z = f(x, y)$

REAL LIFE APPLICATIONS

Differential equations are incredibly versatile and have numerous real-life applications across various

fields. Here are some examples that degree college students might find interesting:

1. **Weather Forecasting:** Differential equations are used to model and predict weather patterns by analyzing changes in atmospheric conditions over time
2. **Population Dynamics:** They help in understanding how populations of species grow and interact with each other, which is crucial for ecology and conservation efforts.
3. **Engineering:** In mechanical and electrical engineering, differential equations are used to design and analyze systems like circuits, engines, and control systems.
4. **Economics:** They are used to model economic growth, predict market trends, and understand the dynamics of supply and demand.
5. **Medicine and Healthcare:** Differential equations help model the spread of diseases, the dynamics of drug delivery, and the behavior of biological systems.
6. **Environmental Science:** They are used to study pollution dispersion, the impact of human activities on ecosystems, and climate change models.
7. **Physics:** In classical mechanics, thermodynamics, and quantum mechanics, differential equations describe how physical systems evolve over time.
8. **Biology:** They model the growth rates of bacteria, the spread of diseases, and the dynamics of ecosystems.
9. **Finance:** Differential equations are used to model stock prices, interest rates, and financial derivatives.

Exponential growth can be modelled by differential equations and has many real-life applications. Here are some examples:

1. Population Growth

- **Model:** $\frac{dP}{dt} = kP$, where $P(t)$ is the population at time t , and k is the growth rate.
- **Explanation:** In ideal conditions (e.g., unlimited resources), population grows proportionally to its current size, leading to exponential growth.
- **Real-life example:** Bacteria multiplying in a petri dish or human population growth (in the absence of resource limitations).

2. Radioactive Decay

- Model: $\frac{dN}{dt} = -\lambda N$, where $N(t)$ is the quantity of the radioactive substance, and λ is the decay constant.
- Explanation: The number of radioactive atoms decays at a rate proportional to the current number of atoms, leading to exponential decay.
- Real-life example: The decay of uranium-238 or carbon-14 in radiometric dating.

3. Interest Growth in Finance (Compound Interest)

- Model: $\frac{dA}{dt} = rA$, where $A(t)$ is the amount of money at time t , and r is the interest rate.
- Explanation: Money in an interest-bearing account grows exponentially, as the interest earned is proportional to the current balance.
- Real-life example: Savings accounts, investment portfolios with continuously compounding interest.

4. Spread of Diseases (Epidemic Models)

- Model: $\frac{dI}{dt} = \beta I$, where $I(t)$ is the number of infected individuals, and β is the transmission rate.
- Explanation: In the early stages of an epidemic, the number of infected individuals can grow exponentially if there are no interventions like vaccination.
- Real-life example: The initial phase of COVID-19 spread, where each infected individual can infect multiple others.

5. Newton's Law of Cooling

- Model: $\frac{dT}{dt} = -k(T - T_{\text{env}})$, where $T(t)$ is the temperature of an object, T_{env} is the ambient temperature, and k is the cooling constant.
- Explanation: The rate at which an object cools is proportional to the difference between its temperature and the surrounding temperature.
- Real-life example: Cooling of a cup of coffee, or cooling of a metal after heating.

6. Investment Growth in Economics

- Model: $\frac{dI}{dt} = rI$, where $I(t)$ is the investment amount and r is the growth rate.
- Explanation: Investment returns can grow exponentially when returns are reinvested, leading to compound growth. **REAL-LIFE EXAMPLE:** The growth of a stock portfolio in the stock market.



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DEPARTMENT OF MATHEMATICS

Date: 30-09-2024

OUTCOMES OF THE PROGRAM

Students will be able to

- identify first order ordinary differential equations.
- understand basic concepts of higher order ordinary differential equations.
- solve linear differential equations using different methods.
- prove theorems, solve ordinary differential equations.
- apply concepts of ordinary differential equations and applications including real life problems.



**GOVERNMENT DEGREE
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DEPARTMENT OF MATHEMATICS

Date:30-09-2024

Topic: Applications of Mathematics in Various Fields

Time: 10 AM

GUEST LECTURE ATTENDANCE SHEET

S.No	Name of the student	Class	Group	Roll No	Signature of the student
1.	Pethani prakash	I.BSC	computer	05	P.Pethani
2	Pandu venkata Naveen	I BSc	chemistry	08	P.V.Naveen
3	P.Venkata Ganesha	I. BSc	computers	06	P.V. Ganesha
4	M. Chaitanya Sushma anya Potesad.	I. BSc	chemistry	10	M.Ch S. Potesad
5	B. Murali Ram Kumar	I. BSc	Chemistry	03	B.m. Ram Kumar
6.	G. Yogendhra	I B.sc	chemistry	04	G. Yogendhra
7,,	Guttala prasanth kumar	I.BSc	chemistry	11	G.P.kumar
8	D.Naga Sanjay	I BSc	chemistry	12	D.N. Sanjay
9.	Gubbala Bhavana vijaya sree	IBSc	chemistry	05	G.Bhavana vijaya sree
10	Koppiseti Sai ganga pravallika	IBSc	chemistry	06	K.Sai ganga pravallika
11.	Balasodi. Bhargavi i. lakshmi	I BSc	chemistry	02	B.B. lakshmi
12.	Kolisetti. Pavani lakshmi Durga	I BSc	computers	03	K. Pavani
13.	V.Mounika	I BSc	computers	07	V.Mounika

14.	J.V.S.S. Surekha	7 th BSC	Computers	02	J.V.S.S. Surekha
15.	G. Divya	8 th BSC	Computers	01	G. Divya
16.	M. Sanyasi	8 th BSC	Chemistry	09	M. Sanyasi
17.	D. Mahalakshmi	III BSC	MPCS	4	D. Mahalakshmi
18.	Ch. Navya	III BSC	MPCS	03	Ch. Navya
19.	K. Kushideepika	III BSC	MPCS	07	K. Kushideepika
20.	T. Sowjanya	III BSC	MPCS	16	T. Sowjanya
21.	P. Sravanthi	III BSC	MPCS	12	P. Sravanthi
22.	S. Durgalakshmi	III BSC	MPCS	15	S. Durgalakshmi
23.	Ch. Vijaya Sri Lakshmi	III BSC	MPCS	02	Ch. Vijaya Sri Lakshmi
24.	P. Bhumiya	III BSC	MPCS	13	P. Bhumiya
25.	V. Anitha	III BSC	MPCS	17	V. Anitha
26.	L. Prameela	III BSC	MPCS	09	L. Prameela
27.	K. Haritha	III BSC	MPCS	08	K. Haritha
28.	V. Vanu Praxanna	III BSC	MPCS	18	V. Vanu Praxanna
29.	G. Mounika	III BSC	MPCS	05	G. Mounika

Signature of the Principal

30.9.24

PRINCIPAL
GOVERNMENT DEGREE COLLEGE
MUMMIDIVARAM - 533 216
Dr. B. R. Ambedkar Konaseema Dist. A.P.

Signature of the Lecturer in charge

K. CHITTIBABU

M.Sc, CSIR-JRF, NET

Lecturer in charge
Department of Mathematics
Govt. Degree College
MUMMIDIVARAM - 533216
Dr. B. R. Ambedkar Konaseema Dist. A.P.

Estb: 2021
Mail: gdcummdivaram.jke@gmail.com

Office : 088562 93784
Principal: 9866668182



GOVERNMENT DEGREE COLLEGE,
MUMMIDIVARAM
Dr.B.R.AMBEDKAR KONASEEMA
DISTRICT- 533216



Dr.S.PRABHAKAR M.A., Ph.D
Principal

Mummidivaram,
Dt: 30-09-2024

ATTENDANCE CERTIFICATE

This is to certify that Dr.D.CH.Paparao, Senior Lecturer, Department of Mathematics, V.K.V.Govt Degree College, Kothapeta attended and delivered a talk on “**Applications of Differential Equations in Various Fields**” on 30.09.2024 at Government Degree College, Mummidivaram. The Lecture is very useful to educate and enlighten our students about the applications of Mathematics in Various fields.

PRINCIPAL 30.9.24

PRINCIPAL

GOVERNMENT DEGREE COLLEGE

MUMMIDIVARAM - 533 216

Dr.B.R. Ambedkar Konaseema Dt. A.P.



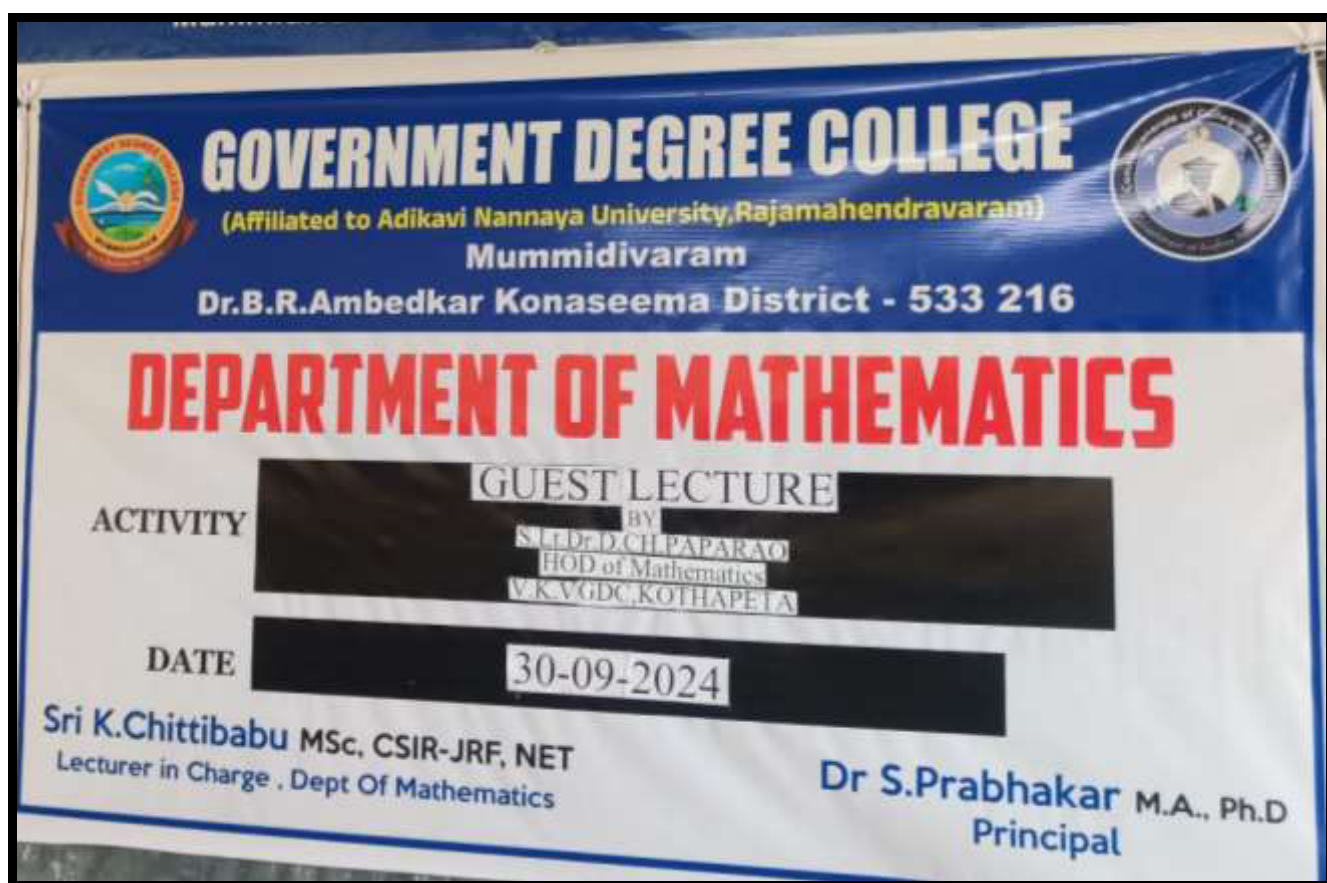
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Dr.B.R.Ambedkar
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DEPARTMENT OF MATHEMATICS

Date: 30-09-2024

PHOTOS OF THE PROGRAM





Inviting Guests to the dais by Sri D.Pallamraju, Lecturer in Chemistry



Opening remarks by the Principal: Dr.S.PRABHAKAR garu



Prayer by final year Studetns: D.Mahalakshmi, T.Sowjanya



Introduction of Resource Person: Dr.G.Sujatha garu, Lecturer in English.



**Briefing by Sri.K.CHITTI BABU, VICE-PRINCIPAL and HOD of Mathematics
Government Degree College, MUMMIDIVARAM.**



**Guest Lecture by S.Lt Dr.D.CH.Paparao, H.O.D, Department of Mathematics,
V.K.V.GDC, Kothapeta.**



Feedback given by Student Kumari L.Prameela, III B.Sc (M.P.Cs)



Felicitation to the Resource Person by Principal, Staff & Students



Vote of Thanks by Sri.K.CHITTI BABU, VICE-PRINCIPAL and HOD of Mathematics, Government Degree College, MUMMIDIVARAM.



National Anthem by Principal, Staff and Students.