

## Chapter - 1

Force and moment (Resultant and Equilibrium)

Engineering mechanics  $\Rightarrow$  It is the branch of physical science which deals with the state of a body under the action of external agency.

State  $\begin{cases} \rightarrow \text{state of rest} \\ \rightarrow \text{state of motion} \end{cases}$

External agency  $\begin{cases} \rightarrow \text{Force} \\ \rightarrow \text{moment} \end{cases}$

Force  $\Rightarrow$  Force is an action of an external agency which changes or tries to change the state of a body. (Unit = Newton; Push/Pull)

Moment  $\Rightarrow$  It is a measure of turning effect.  
 Unit = Nm  
 moment = Force  $\times$  distance

moment about O =  $F \times d$

Quantity  $\Rightarrow$  Anything which can be measured directly or indirectly.

- i) Scalar (mag)
- ii) vector (mag - dir)

Rigid body  $\Rightarrow$  When there is no deformation in the body after the application of external force, the body is said to be rigid.  $\Rightarrow$  Deformation is very negligible, so neglected.  $\Rightarrow$  No body is perfectly rigid.

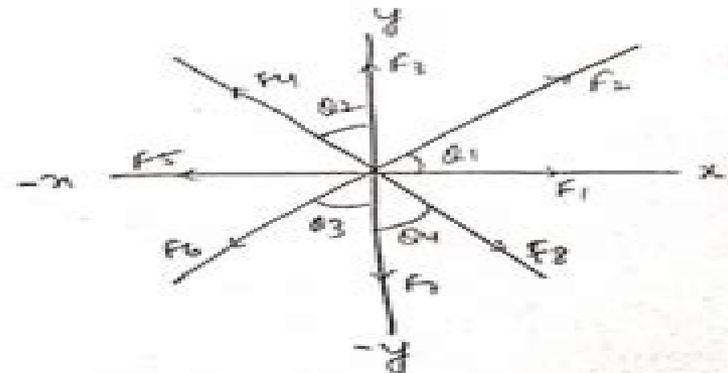
Resolution of force  $\Rightarrow$



Composition of forces  $\Rightarrow$

$\Sigma F_x =$  Horizontal  $= F_1 + F_2 \cos \theta_1 - F_4 \sin \theta_2 - F_5 - F_6 \sin \theta_3 + F_8 \sin \theta_4$

$\Sigma F_y =$  Vertical  $= F_2 \sin \theta_1 + F_3 + F_4 \cos \theta_2 - F_6 \cos \theta_3 - F_7 - F_8 \cos \theta_4$



# Drainage Engineering Lecture Notes

**Iowa State College. Civil Engineering  
Department**



## **Drainage Engineering Lecture Notes:**

*Modern Land Drainage* Willem Vlotman, Lambert Smedema, David Rycroft, 2020-05-07 *Modern Land Drainage* 2nd edition is a fully revised and updated edition of the 2004 edition *Modern Land Drainage* describes traditional drainage formulas Hooghoudt Kirkham Donnan Ernst Glover Dumm for rainfed agriculture in the humid temperature zone Significant parts are devoted to drainage for salinity control of irrigated land in semi arid zones and to drainage of rice land in the humid tropics Institutional management and maintenance aspects are extensively covered as well as the mitigation of adverse impacts of drainage interventions on the environment The latest computer applications for drainage design in the context of integrated water management are described DRAINMOD HEC SWAP etc Field surveys are executed by governments with the aid of consultants but rarely are the end stakeholders i.e. farmers and general public involved from inception to planning to execution of a drainage system Yet during the Operation Management and Maintenance OMM phase of a water management system they are expected to takeover run bear and be responsible for the costs of OMM The book describes successful methodologies and processes to be followed for engagement of stakeholders at all levels from government to farm from minister to farmer and from beginning to end The book covers all aspects needed for sustainable drainage The latest survey methodologies with satellites and drones are suggested to assess cause and effect Waterlogging and salinity are the effect of something caused most likely upstream of the drainage problem location Hence treating the cause may be more cost effective Triple Bottom Line social environmental and financial considerations and the water food energy nexus are an integral part of the drainage design process Controlled drainage i.e. the balance of removal and conservation of drainage water and minimising solute transport as low as reasonably achievable ALARA principle is extensively described This work is intended for use both as a university level textbook and as a professional handbook it is of particular value to professionals engaged in drainage development in the context of integrated water resources and river basin management civil and agricultural engineers government officials university students and libraries

**Land Drainage: Principles, Methods and Applications** Bhattacharya, A.K. & Michael, A.M., 2006 *Land Drainage Principles Methods and Applications* presents the latest information concepts and technology for ensuring sustainable agricultural production and environmental management by adopting land drainage measures It focuses on a subject central to the sustainability of irrigated agriculture The authors considerable field work experience and strong grip on the subject are pivotal in conceptualizing this book This book provides an explicit description of the subject for students as well as the practicing engineers in this area A logical sequence is followed in the presentation of chapters beginning with the occurrence of drainage problems their causes remedies design and execution of drainage systems and the benefits of drainage The book can claim to be the only comprehensive title on the subject in India

**SALIENT FEATURES**

- 1 Follows an application centric approach based on mathematical and statistical concepts
- 2 Provides a global scenario of drainage by studying different drainage models
- 3 Discusses drainage in the Indian

context 4 Text is supported by statistical inputs and well illustrated examples 5 Includes self assessment questions with answers and a number of solved and unsolved problems 6 Includes case studies of Drainage and Salt Management

**Model Predictive Control on Open Water Systems** Peter-Jules van Overloop,2006 In the research Model Predictive Control on Open Water Systems the relatively new control methodology Model Predictive Control is configured for application of water quantity control on open water systems especially on irrigation canals and large drainage systems The methodology applies an internal model of the open water system by which optimal control actions are calculated over a prediction horizon As internal model two simplified models are used the Integrator Delay model and the Saint Venant model Kalman filtering is applied to initialize the internal models The optimization uses an objective function in which conflicting objectives can be weighed In most of the cases these conflicting objectives are keeping the water levels at different locations in the water system within a range around setpoint and executing this by using as little control effort or energy as possible

*Notes and Lectures on Irrigation and Drainage* Iowa State College. Department of Agricultural Engineering,191?

**Reliability and Optimization of Structural Systems '91** Rüdiger Rackwitz,Palle Thoft-Christensen,2012-12-06 This proceedings volume contains 38 papers presented at the 4th Working Conference on Reliability and Optimization of Structural Systems held at the Technical University of Munich Germany September 11 13 1991 The Working Conference was organised by the IFIP International Federation for Information Processing Working Group 7 5 of Technical Committee 7 and was the fourth in a series following similar conferences held at the University of Aalborg Denmark May 1987 at the Imperial College London UK September 1988 and at the University of California Berkeley California USA March 1990 The Working Conference was attended by 54 participants from 16 countries The objectives of Working Group 7 5 are to promote modern structural systems optimization and reliability theory to advance international cooperation in the field of structural system optimization and reliability theory to stimulate research development and application of structural system optimization and reliability theory to further the dissemination and exchange of information on reliability and optimization of structural systems to encourage education in structural system optimization and reliability theory At present the members of the Working Group are A H S Ang U S A M Grimmelt FRG G A ugwti Italy N C Lind Canada M J Baker UK H O Mad en Denmark P Bjerager Norway R E Melcher Australia C A Cornell U S A F Mo e U S A *Drainage Engineering Notes* Iowa State College. Civil Engineering Department,1905 **Journal of the Irrigation and Drainage Division** American Society of Civil Engineers. Irrigation and Drainage Division,1976 *General Catalog Issue* Pennsylvania State College,Pennsylvania State University,1888 *The American Contractor* ,1916 The Sanitary Record ,1898 **Highway Engineer and Contractor.** ... ,1920 Register Tulane University,1917 **Typhoid Fever** George Chandler Whipple,1908 Manual of Psychiatry Joseph Rogues de Fursac,1908 *Hydraulics of Rivers, Weirs and Sluices* David Albert Molitor,1908 Power and Power Transmission Eugene Wycliffe Kerr,1908 A Laboratory Guide for Students in Physical Sciences Heinrich

Schapper,1908  
Jacoby,1902

**Sewerage** Amory Prescott Folwell,1901

**Bridge design** Mansfield Merriman, Henry Sylvester

This book delves into Drainage Engineering Lecture Notes. Drainage Engineering Lecture Notes is a vital topic that needs to be grasped by everyone, ranging from students and scholars to the general public. This book will furnish comprehensive and in-depth insights into Drainage Engineering Lecture Notes, encompassing both the fundamentals and more intricate discussions.

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