

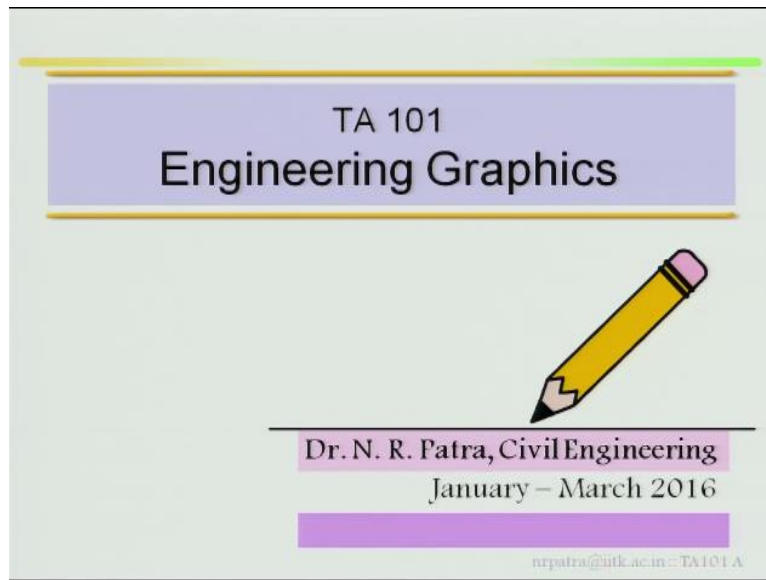
Indian Institute of Technology Kanpur
National Programme on Technology Enhanced Learning (NPTEL)
Course Title
Engineering Graphics

Lecture – 01
Course objective, Lettering and Numbering

by
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Department of civil engineering, IIT Kanpur

So TA 101.

(Refer Slide Time: 00:16)



Engineering Graphics, so.

(Refer Slide Time: 00:20)

Course OBJECTIVE

- To learn basics of Engineering Drawing
 - Advanced topics of Engineering Drawing in other courses
 - Civil Engineers
 - Mechanical Engineers
 - Mathematics
 - Physics
 - ...

First this basic outlines of this course, the objective that this course to law on basic engineering drawings, advanced topics of engineering drawings in other courses, for example civil engineering, mechanical engineering, mathematics, physics, almost all branches of engineering they need engineering drawings or engineering graphics course.

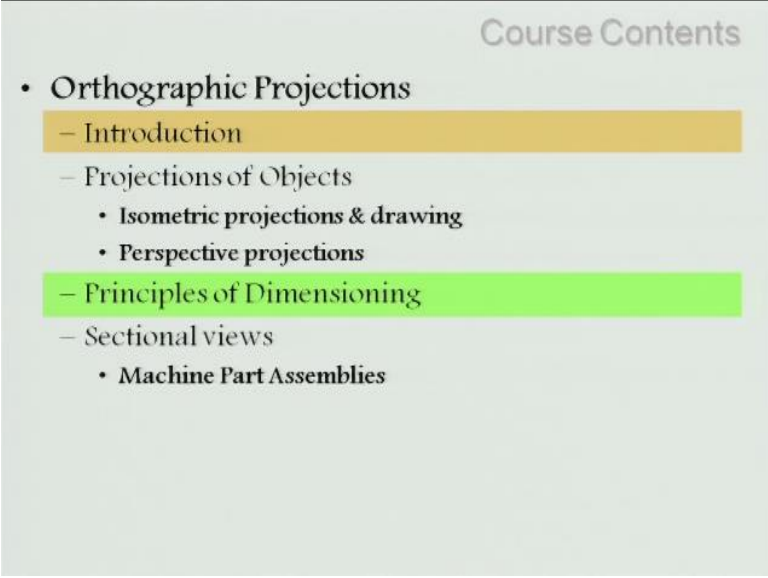
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Course Contents	
•	Introduction to the Course
•	Basics of Engineering Drawing
–	Need
–	Tools
•	Drawing Paper
•	Pencils
•	Drafter
•	Set squares
•	French Curves
–	Lettering and Drawing
–	Geometric Constructions

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So basic course content, so basic engineering drawing what they need and different tools, drawing paper, pencil, and drafter, set squares, French curves, then lettering and drawing, geometric constructions, geometry constructions means parabola, ellipse, curves, different geometric constructions.

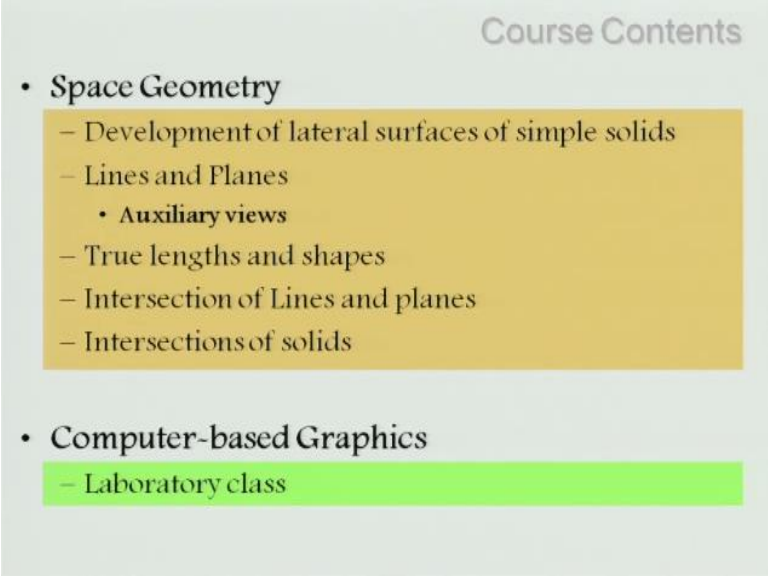
(Refer Slide Time: 01:09)

A slide titled "Course Contents" with a list of topics. The topics are: Orthographic Projections, Introduction, Projections of Objects, Isometric projections & drawing, Perspective projections, Principles of Dimensioning, Sectional views, and Machine Part Assemblies. The "Introduction" and "Principles of Dimensioning" items are highlighted with yellow and green bars respectively.

Course Contents	
• Orthographic Projections	
– Introduction	
– Projections of Objects	
• Isometric projections & drawing	
• Perspective projections	
– Principles of Dimensioning	
– Sectional views	
• Machine Part Assemblies	

Then first partition orthographic projections, in this orthographic projections we will cover introductions, projections of objects, isometric projections and drawings, prospective projections, then principles of dimensioning, how to do the dimensioning of any object, sectional views, machine part assemblies.

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A slide titled "Course Contents" with a light gray background. It lists two main topics: "Space Geometry" and "Computer-based Graphics". The "Space Geometry" section is highlighted with a yellow background and includes sub-points: "Development of lateral surfaces of simple solids", "Lines and Planes" (which further includes "Auxiliary views"), "True lengths and shapes", "Intersection of Lines and planes", and "Intersections of solids". The "Computer-based Graphics" section is highlighted with a green background and includes the sub-point "Laboratory class".

Course Contents	
• Space Geometry	
– Development of lateral surfaces of simple solids	
– Lines and Planes	
• Auxiliary views	
– True lengths and shapes	
– Intersection of Lines and planes	
– Intersections of solids	
• Computer-based Graphics	
– Laboratory class	

Next part of your course content, space geometry, in space geometry development of lateral surfaces of simple solids, lines and planes, auxiliary views, true lengths and shapes, intersection of lines and planes, intersection of solids, last one is your computer based graphics or laboratory class.

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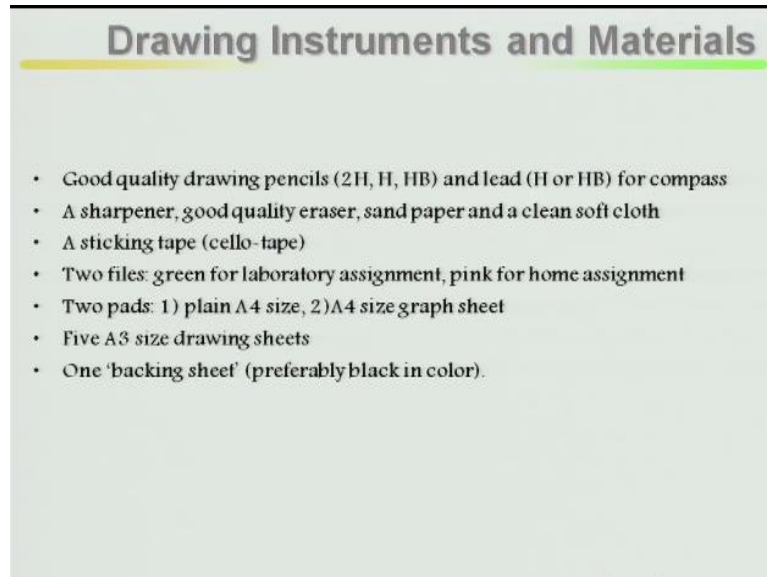
Drawing Instruments and Materials

- Instrument box containing the following minimum items:
 - A large compass
 - A bow compass with adjusting screws (100 mm)
 - A large divider
 - A bow divider with adjusting screws (100 mm)
- A good quality drafter
- A pair of set-squares: 45-45°, 30-60° (250 mm, 2.5 mm thick)
- A protractor
- A scale, 300 mm (steel or hard plastic)

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Now drawing instruments and materials required in this course, instrument box containing the following minimum items, a large compass and a bow compass, large divider, bow divider and good quality drafter, a pair of set squares, protractors, scale

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Good quality drawing pencils, generally you should have three sets of pencils, 2H, H, HB and leads for H or HB sharpeners, sticking tapes, two files green for laboratory assignment, pink for home assignment, two parts plane A4 size, and second is your A4 size graph sheets, A3 drawing sheets, and one black sheets.

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Drawing Instruments and Materials

- Drawing Paper
 - Standard paper in India
 - A-series
 - Constant aspect ratio



1

$\sqrt{2}$

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Drawing Instruments and Materials


- Good quality drawing pencils (2H, H, HB) and lead (H or HB) for compass
- A sharpener, good quality eraser, sand paper and a clean soft cloth
- A sticking tape (cello-tape)
- Two files: green for laboratory assignment, pink for home assignment
- Two pads: 1) plain A4 size, 2) A4 size graph sheet
- Five A3 size drawing sheets
- One 'backing sheet' (preferably black in color).

Preferably in a black in color.

(Refer Slide Time: 02:58)

Drawing Instruments and Materials

- Drawing Paper
 - Standard paper in India
 - A-series
 - Constant aspect ratio



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Now what are the sizes of your drawing papers? Standard papers in India generally it is called A series 1: $\sqrt{2}$ size.

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Drawing Instruments and Materials

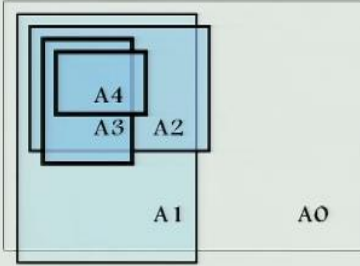
- Drawing Paper...
 - Standard paper in India...
 - A-series
 - A0, A1, A2, A3, A4, ...
 - Each size following has half the area of the previous size
 - ✓ Area of A0 = 1 m^2 841mm × 1189mm
 - ✓ Area of A1 = 0.5 m^2 594mm × 841mm
 - ✓ Area of A2 = 0.25 m^2 420mm × 594mm
 - ✓ Area of A3 = 0.125 m^2 297mm × 420mm
 - ✓ Area of A4 = 0.0625 m^2 210mm × 297mm
 - ✓ ...

Different sizes A0, A1, A2, A3, as well as A4 size now.

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Drawing Instruments and Materials

- Drawing Paper...
 - Standard paper in India...
 - A-series
 - One dimension common for subsequent sizes



The diagram illustrates the A-series of drawing paper sizes. It shows five nested rectangles representing the sizes A0, A1, A2, A3, and A4. The rectangles are arranged such that A4 is the smallest and is nested within A3, which is nested within A2, which is nested within A1, which is nested within A0. The labels A4, A3, A2, A1, and A0 are placed inside their respective rectangles. The diagram demonstrates that as the size decreases, the dimensions are halved, but one dimension remains constant across the series.

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If you come to your drawings.

(Refer Slide Time: 03:19)

The image shows a template for an A3 drawing sheet. It features a large rectangular area for the drawing, a title box at the top left, and a student information box at the bottom right. The title box contains the text 'Drawing Sheet'. The student information box contains the following fields: 'I.I.T. KANPUR', 'TA101 - ENGINEERING GRAPHICS', 'NAME:', 'ROLL NO. *****', 'SIGNATURE', 'DATE:', and 'SECTION:'. The email address 'nrpatra@iitk.ac.in - TA101A' is printed at the bottom right of the sheet.

Drawing Sheet				
			I.I.T. KANPUR	
			TA101 - ENGINEERING GRAPHICS	
NAME:	ROLL NO. *****			
SIGNATURE	DATE:	SECTION:		

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This is a typical A3 drawing sheet in typical A3 drawing sheet if you looked at you looked at your typical drawing A3 then there is your title box, this is called your title box if you look at this title box generally you write it your Institute, then your course TA10, name, signature, date, section, and roll number.

(Refer Slide Time: 03:46)

Title Block

I.I.T. KANPUR		10 mm
		8 mm
		8 mm
		8 mm
NAME:	ROLL NO. *****	8 mm
SIGNATURE	DATE:	8 mm
SECTION:		

← 120 mm →

Draw Guidelines 2 mm from the top and bottom

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The title block has dimensions complete dimensions first one is your 10 mm, 10mm, 8mm, 8mm, 8mm, 8mm, and 8mm, size is your 120mm but base width is your 120mm, draw guidelines 2mm from top and bottom, guidelines would be 2mm from top and bottom, so how it looks like.

(Refer Slide Time: 04:22)

The image shows a drawing sheet template. At the top, there is a horizontal bar with a yellow-to-green gradient. Below this, the text "Drawing Sheet" is centered. A large rectangular box occupies the center of the page. In the bottom right corner of this box, there is a smaller table for student information. The table has the following structure:

I.I.T. KANPUR		
TA101 – ENGINEERING GRAPHICS		
NAME:	ROLL NO. *****	
SIGNATURE	DATE:	SECTION:

At the bottom right of the drawing sheet, outside the main box, the email address `nrpatra@iitk.ac.in` and the code `TA101A` are displayed.

In a drawing sheet once you come to the class, first you prepare your title box, write name, roll number and sign it, put your signature, then write what is your topic, what topic you are doing suppose you are doing lettering you write it lettering, suppose you are doing orthographic projections you write it orthographic projections.

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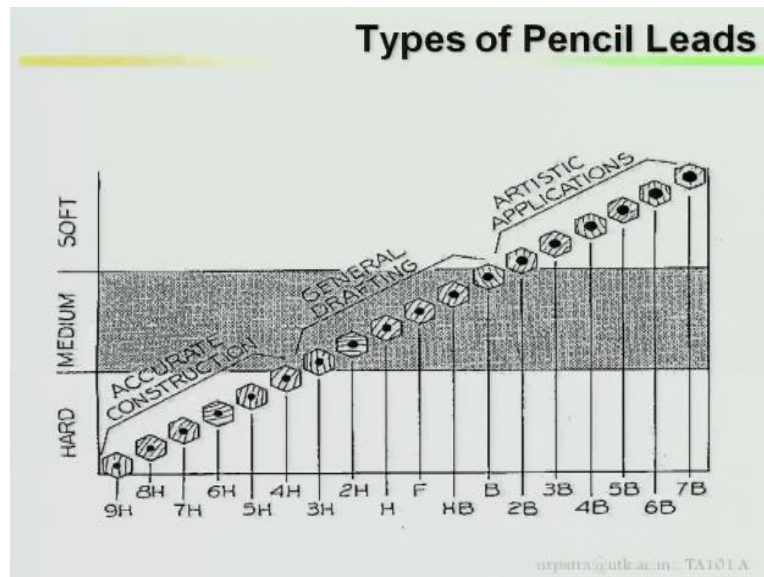
Title Block

I.I.T. KANPUR		10 mm
		8 mm
		8 mm
		8 mm
NAME:	ROLL NO. *****	8 mm
SIGNATURE	DATE:	8 mm
SECTION: → 120 mm ←		

Draw Guidelines 2 mm from the top and bottom

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Then types of pencil leads, if you look at here different types of pencil leads are there so different types of pencil leads if I classify into it there is from 9H TO 7B so first one is your per between 9H TO 4H this is your accurate constructions it comes under hard, then generally for drawing purpose this will be varying form H, 2H and HB generally these are all your general drafting or general drawing it comes under your medium, then 2B, 3B, 4B, 5B, 6B, 7B these are all artistic applications these are called as soft pencil leads.

So you have to H, 2H as well as HB pencils to bring for your drawing class.

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Drawing Scales

$$\text{Scale} = \frac{m}{n} = \frac{\text{Linear Dimension in the Drawing}}{\text{Corresponding Actual Linear Dimension}}$$

Full Size → 1 : 1

Enlarged Scales: 50:1; 20:1; 10:1; 5:1; 2:1

Reduction Scales: 1:2; 1:5;1:10000

**Dimensions are always in mm in engineering drawings
(unless otherwise stated)**

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Then another part is your scale, so before starting your drawing you have to go for a scale, generally scale is your m by n.

(Refer Slide Time: 05:39)

Drawing Scales

$$\text{Scale} = \frac{m}{n} = \frac{\text{Linear Dimension in the Drawing}}{\text{Corresponding Actual Linear Dimension}}$$

Full Size → 1 : 1

Enlarged Scales: 50:1; 20:1; 10:1; 5:1; 2:1

Reduction Scales: 1:2; 1:5;1:10000

**Dimensions are always in mm in engineering drawings
(unless otherwise stated)**

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m by n is your linear dimensions in the drawing and corresponding actual linear dimension, so full size is 1: 1 if I want to enlarge. Enlarge means actual dimension is suppose x by x I want to show it in enlarged view in a drawing generally you have to write it 50 : 1, 20 : 1, 10 : 1, 5 : 1 and 2:1, reduction scales generally we write it reverse 1:2, 1:5, 1:10000 or 1:100. Generally in drawings dimensions are always in mm millimeters unless otherwise it is not specifies you assume whenever there is a course since you assume this dimensions are in mm.

(Refer Slide Time: 06:30)

Books

- **References**
 - French, T.E., Vierck, C.J., and Foster, R.J., **Graphics Science and Design**, McGraw Hill Book Company, New York, Fourth Edition, 1984
 - Bhatt, N.D., **Elementary Engineering Drawing**, Charoter Publishing, Anand, Thirty First Edition, 1990
 - French, T.E., Vierck, C.J., and Foster, R.J., **Engineering Drawing and Graphic Technology**, McGraw Hill International, Singapore, Thirteenth Edition, 1987
 - Luzadder, W.J., and Duff, J.M., **Fundamentals of Engineering Drawing**, Prentice Hall India, New Delhi, Eleventh Edition, 1983
 - Bethune, J.D., **Engineering Graphics with AutoCAD**, Prentice Hall, Englewood Cliffs, First Edition, 1995
 - Sidheswar, P., Kannaiah, P., and Sastry, V.V.S., **Machine Drawing**, Tata McGraw Hill Publishing Company Ltd., 1996

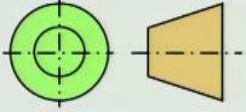
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Books, so reference books, French book graphic science and design, 1984 then Bhatt N.D Bhatt books are in the vogue in India is also there you can collect it, French and Foster a revised edition new edition 1987 also available, these are the book references, you can follow these book generally primarily I am teaching from this book French and Foster in 1987 revised thirteen editions 1987, other books it can be used as a reference book you can follow it up.

(Refer Slide Time: 07:10)

Instructions

- **Technical...**
 - **Carefully plan the layout of the drawings on the sheet**
 - ☐ Place & arrange various drawings and their parts for pleasing view
 - **Follow THIRD ANGLE PROJECTION scheme unless specifically stated otherwise**
 - ☐ Place this symbol in the Title Block



The diagram illustrates the third angle projection symbol. It consists of a circle on the left, representing the end view, and a truncated cone on the right, representing the front view. The two views are aligned horizontally with a center line. The circle is divided into four quadrants by a horizontal and a vertical center line. The truncated cone is also divided into four quadrants by a horizontal and a vertical center line. The symbol is used to indicate that the drawing follows the third angle projection scheme.

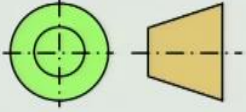
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So technical, before coming to drawing class carefully plan the layout, once you are in drawing class carefully plan your layout of the drawing on the seat, place and arrange various drawings and their parts, generally in drawings we follow third angle projections scheme unless otherwise it is not specified, later on I will explain what is.

(Refer Slide Time: 07:32)

Instructions

- **Technical...**
 - **Carefully plan the layout of the drawings on the sheet**
 - ☐ Place & arrange various drawings and their parts for pleasing view
 - **Follow THIRD ANGLE PROJECTION scheme unless specifically stated otherwise**
 - ☐ Place this symbol in the Title Block



The diagram illustrates the third angle projection symbol. It consists of a circle on the left and a truncated cone on the right, connected by a horizontal center line. The circle is divided into two concentric circles, and the truncated cone is shown in profile. The symbol is used to indicate that the drawing follows the third angle projection scheme.

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First angle, what is third angle projections, in third angle projections unless otherwise it is not specified you generally follow third angle projections.

(Refer Slide Time: 07:43)

Instructions

- **Technical...**
 - **Choose appropriate scales for drawings in an exercise**
 - ☐ Can be different for different questions
 - ☐ Scale of any exercise should be such that all details of the object are clearly visible in the views
 - ✓ Scale used should be clearly written (e.g., scale 1:5).
 - **If all questions of an assignment cannot be accommodated on a single side of the given A1 drawing sheet**
 - ☐ Use the reverse side.

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Then can be different choose appropriate scale for drawing in an exercise as I said earlier.

(Refer Slide Time: 07:48)

Instructions

- **Technical...**
 - **Use good quality pencils**
 - ☐ Wood pencils
 - ✓ Sharpening required
 - ✓ Lines not uniform
 - ☐ Clutch pencils (or mechanical pencils)
 - ✓ No sharpening required
 - ✓ Lines uniform

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Then use good quality of pencils.

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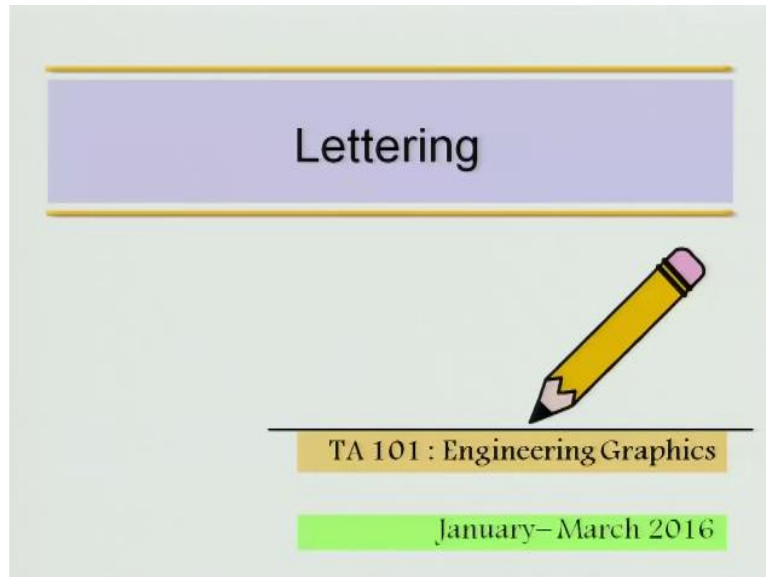
Instructions

- **Technical...**
 - **Use good quality pencil leads**
 - ☐ Grade 2H pencil :: Construction lines & projectors
Hatching
Dimension lines
 - ☐ Grade H pencil :: Objects lines
Lettering
 - ☐ Grade HB pencil :: Lettering
Sketching
 - ☐ Grade 2B pencil :: Free hand sketching (artists!!)
 - **Intensity of lines**
 - ☐ Depends on the PRESSURE applied by the pencil

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Then these are the pencils, grade 2 expenses as I said earlier, constructions lines and projectors, hatching dimensions lines, generally it has been done by means of your 2H pencils, then grade H pencils or H pencils particularly for objects lines, lettering, HB pencils lettering and sketching, grade 2B pencils generally free hand sketching or artistics, this is all about introductions of your engineering graphics or TA101 course.

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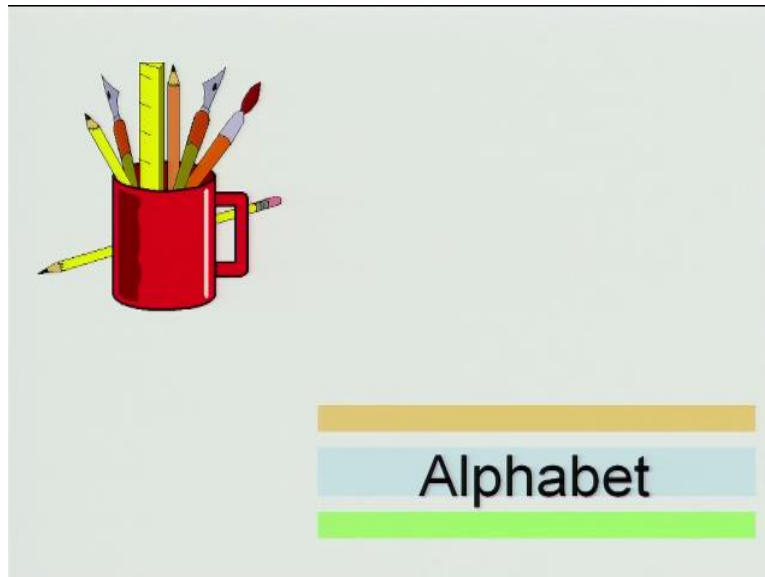
Then first part of this course is lettering, generally in engineering graphics in general normal life you are writing lettering, you are writing your name, you are signing your writing letters, while drafting also drafting essay or drafting a letter but here in engineering lettering is, lettering has to be followed proper procedure, if I look at the pencil.

(Refer Slide Time: 09:01)



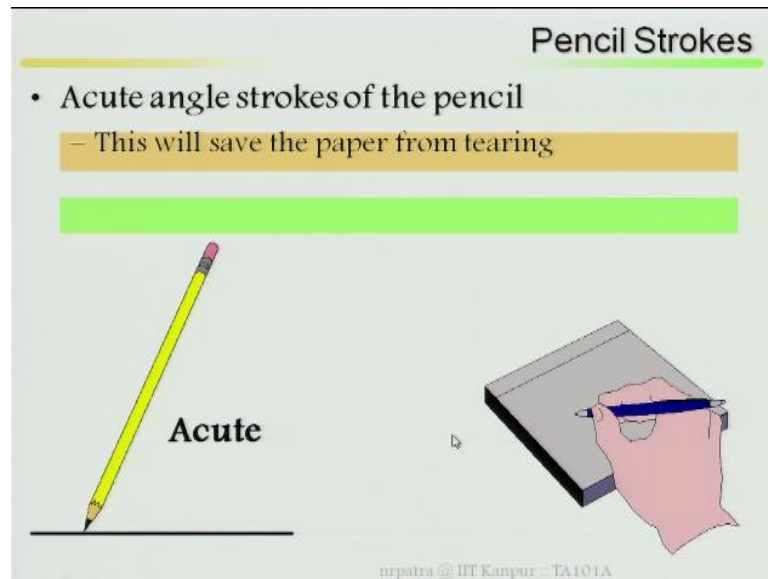
Strokes one is alphabets ABCD, other is your numbers, numbers is your 1, 2, 3, 4, 5, 6.

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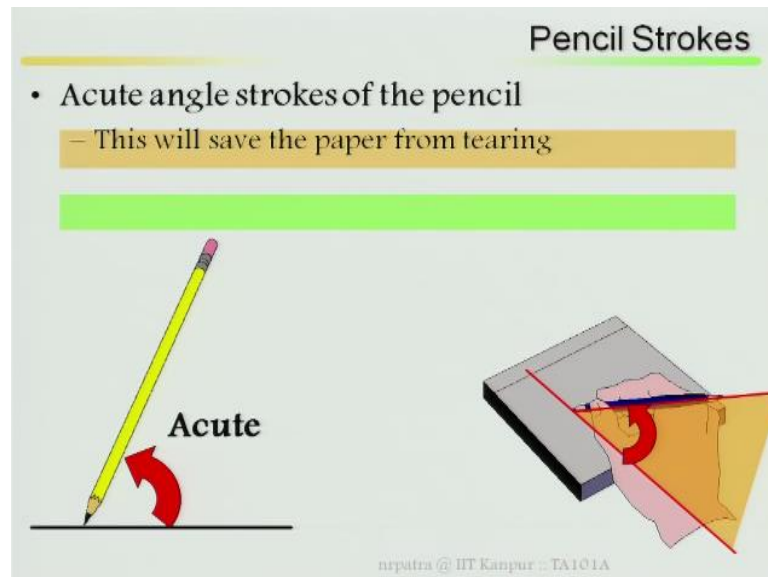
Now start with your alphabets.

(Refer Slide Time: 09:13)



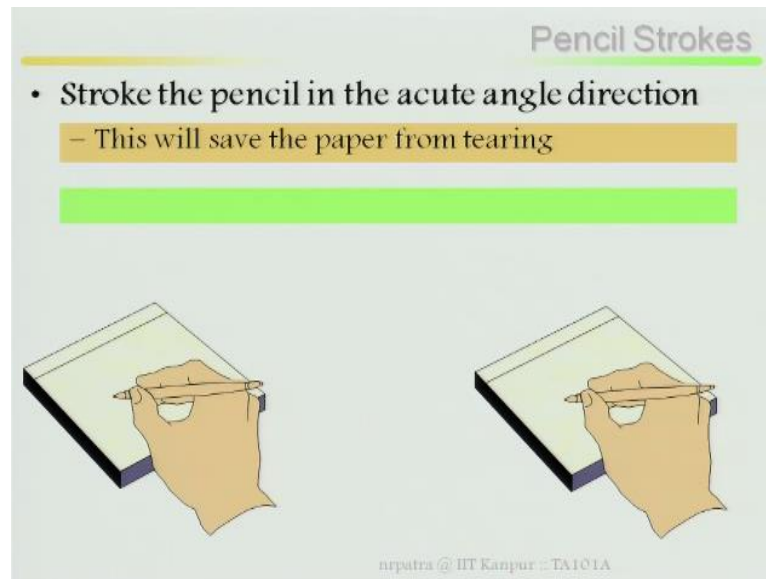
Look at this how the pencils you can put it, acute angle strokes of the pencils, once you keep if it is your drawing sheets, drawing paper, you put your pencils in acute angle, this will save the paper from theory, suppose if I have put my pencil like this.

(Refer Slide Time: 09:3)



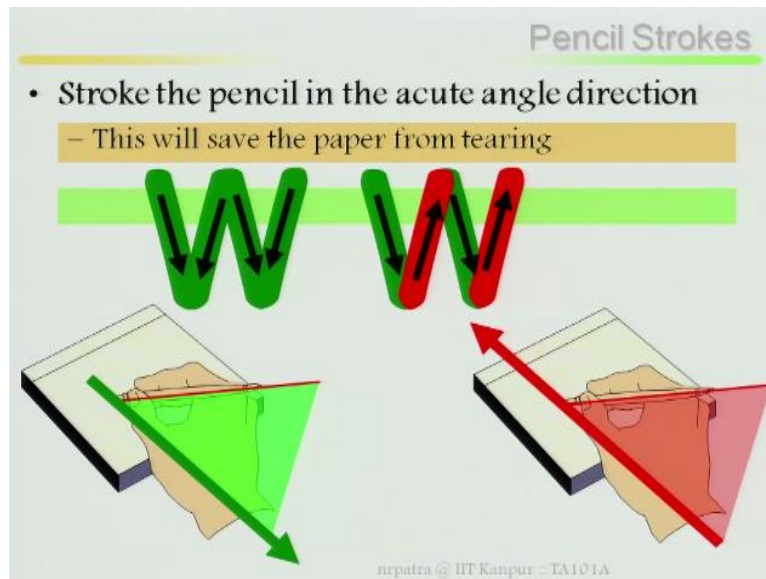
Then it may possible that it may tear the drawing paper, the moment you put it like this so this is acute angle, so in this way you can draw smoothly.

(Refer Slide Time: 09:46)



Stroke the pencils in the acute angle directions as I said.

(Refer Slide Time: 09:52)




Look which is right and which is wrong, if I want to write it W how I am going to write it? There are two examples if you want to write a W how you are going to, look at the strokes.

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Pencil Strokes

- May use guiding lines initially
 - Eventually should avoid using guiding lines

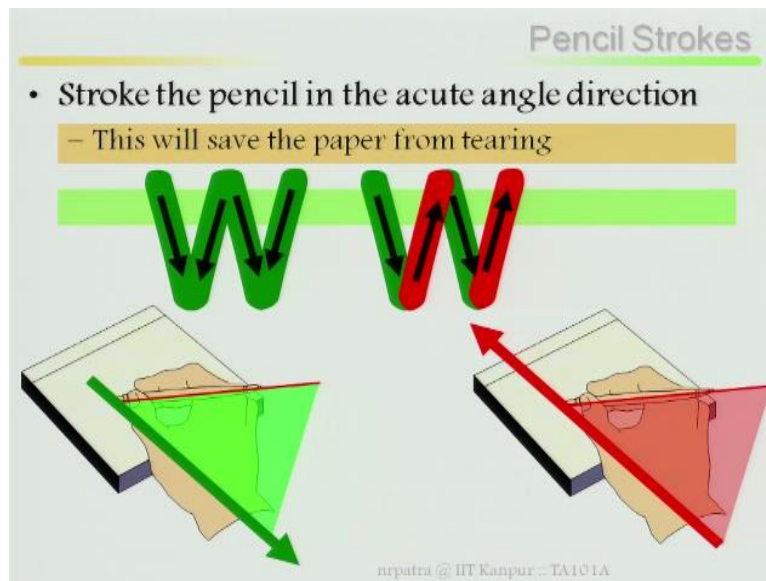


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The image shows a handwriting practice slide. At the top right, the text 'Pencil Strokes' is written in a light blue font. Below it, a bulleted list states: '• May use guiding lines initially' followed by a sub-bullet '– Eventually should avoid using guiding lines' which is highlighted in a yellow box. In the center, the letters 'A' and 'a' are written in a large, bold, green font. They are positioned between three horizontal blue lines that serve as guides. At the bottom, the text 'nrpatra @ IIT Kanpur :: TA101A' is written in a small, light blue font.

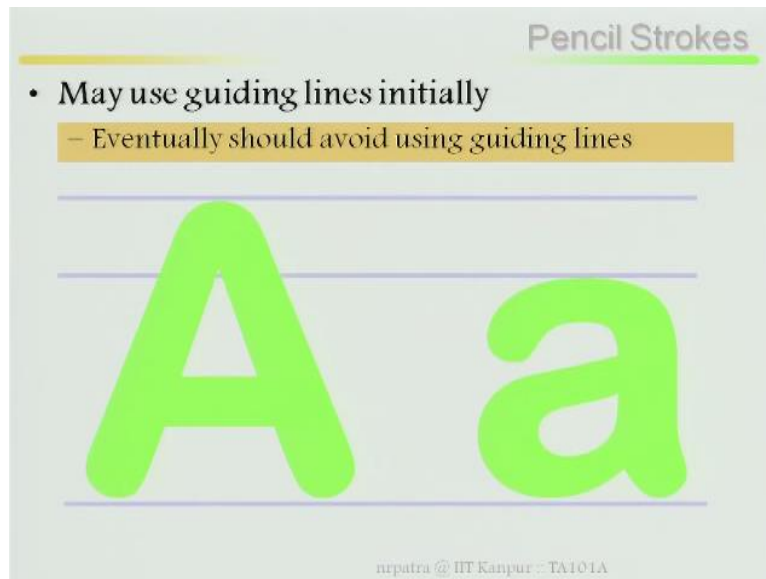
Look at the strokes.

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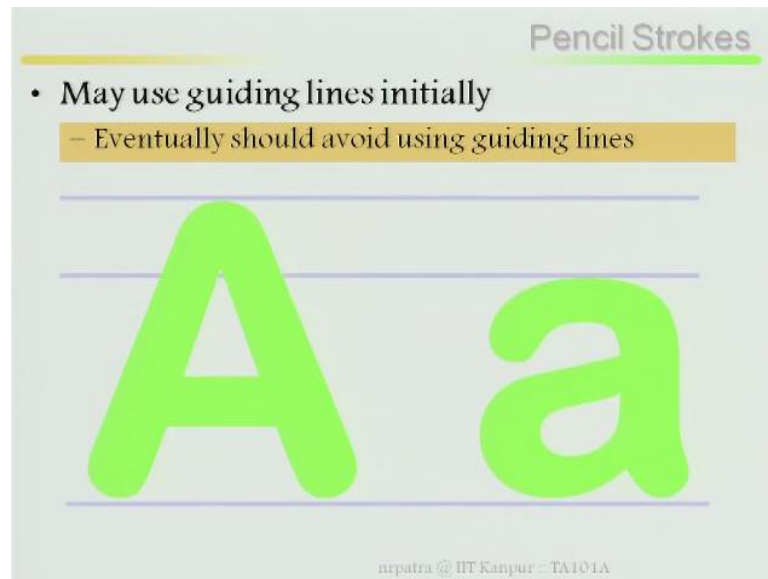
Now in this W first you are preparing one stroke, then second, then third, then fourth, but if you are going writing in reverse way the way I say it is wrong, it will tear your paper.

(Refer Slide Time: 10:37)



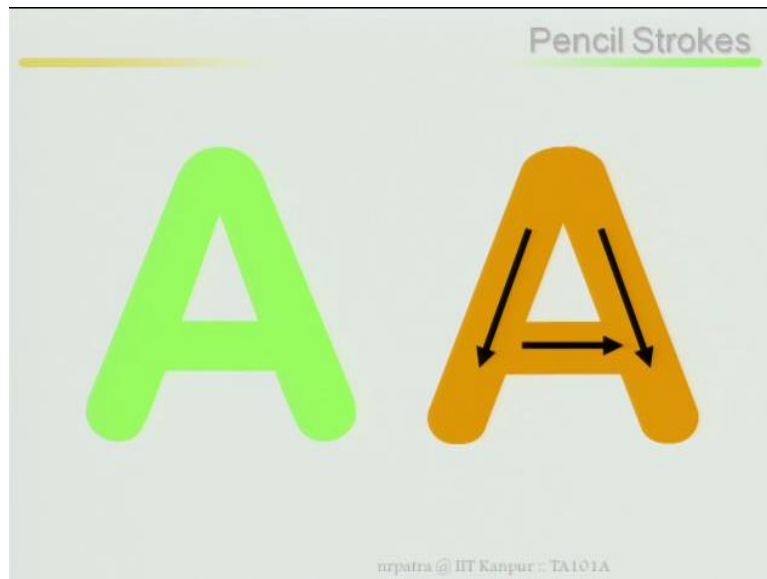
Then we will start one by one, these are all general guidelines, it will eventually once you are going to write your name, roll number, you are anything any, any, any writer part you have to do by means of pencils with by means of lettering with a proper stroke, some of this is.

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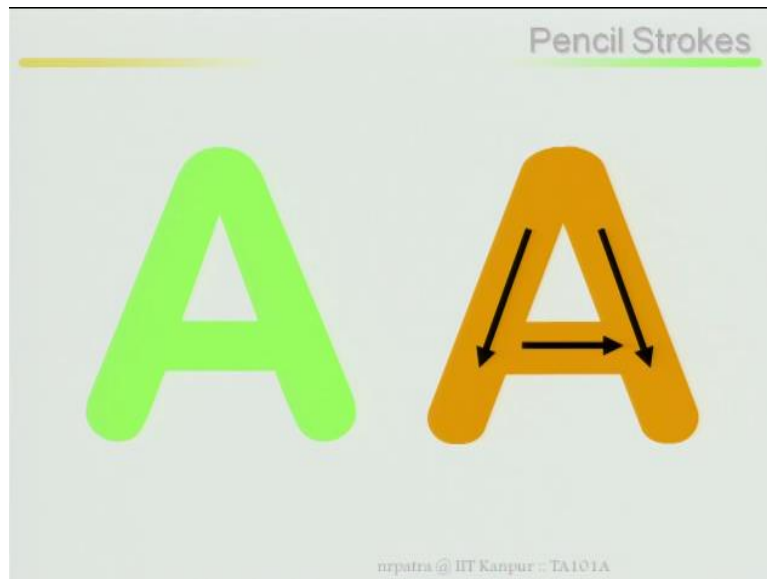
Capital A and this is small a

(Refer Slide Time: 10:59)



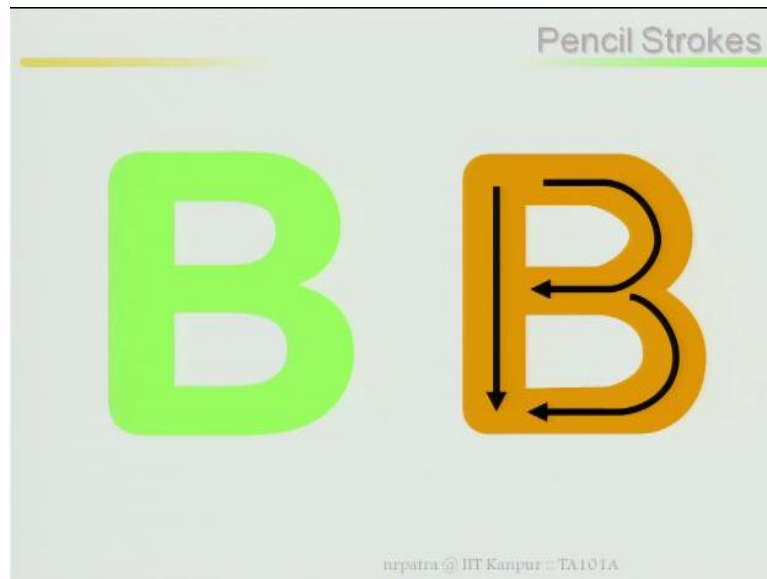
How I am going to write capital A, look at the sequence.

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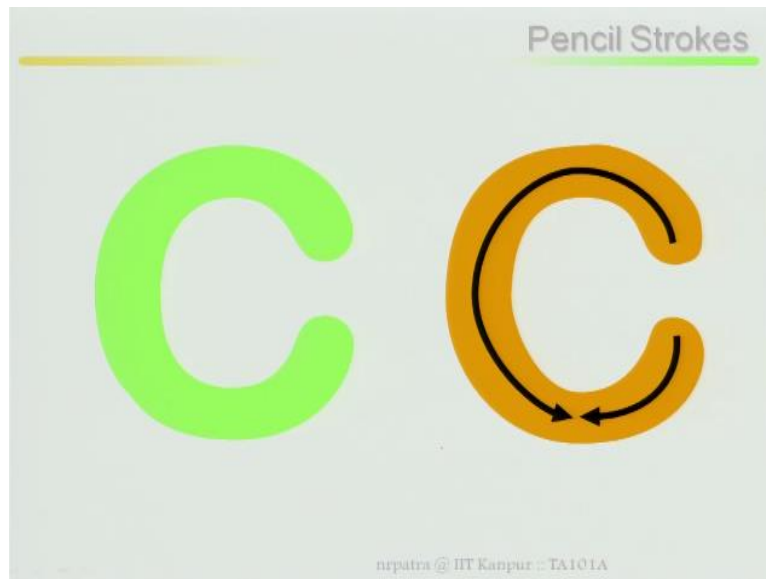
The A is looking like this, now the sequence is, this is my first stroke, second stroke, then this will be a third stroke

(Refer Slide Time: 11:12)



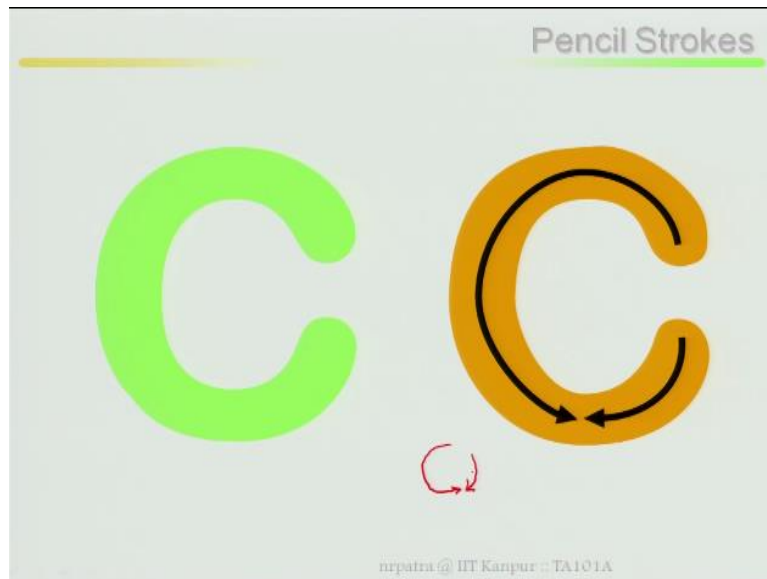
Similarly B look at the B, B is your first stroke, second stroke, then first stroke, second stroke, then third stroke, it completes your B.

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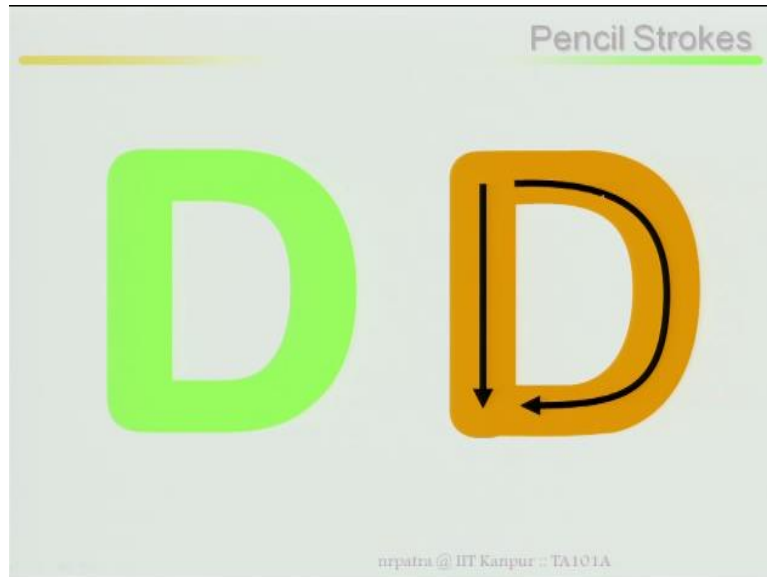
Look at this C how I am writing the C, first part of your stroke is this way.

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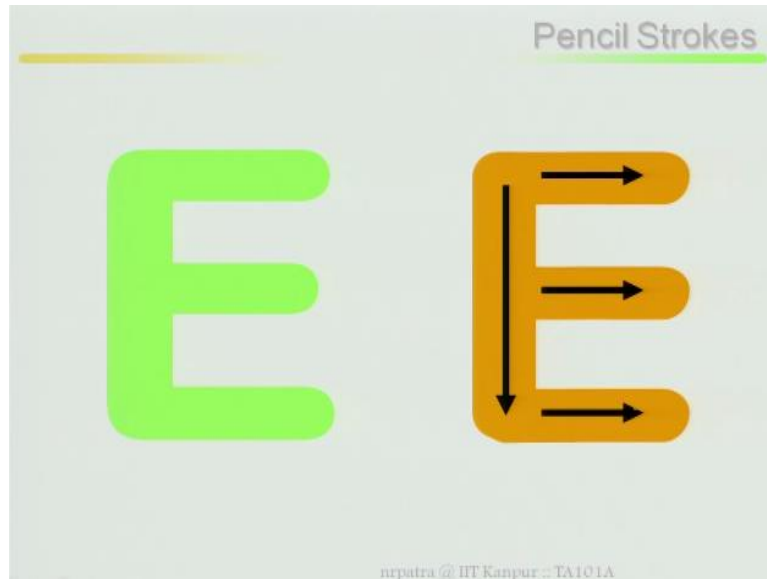
Look at this, this is half almost more than half part, then you cover with this another part, this cover your C in engineering drawing.

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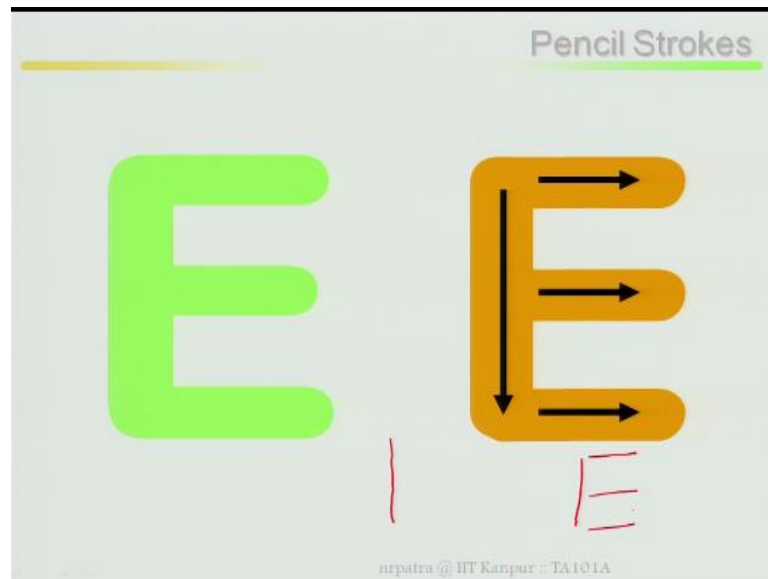
Then come to D first part of your D is a simple stroke, stroke on then D will be covering this way, this is your D, similarly.

(Refer Slide Time: 12:02)



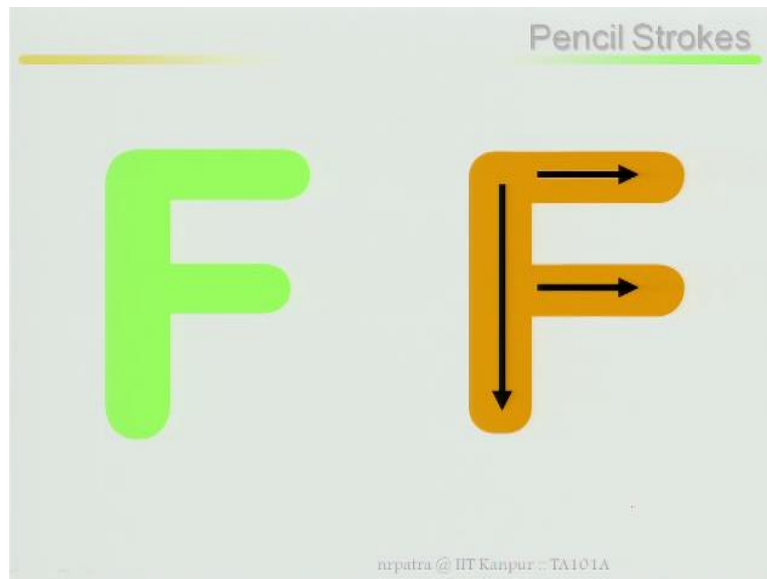
E, is E is very simple, stroke one, two, three, and four, first one is your vertically.

(Refer Slide Time: 12:11)



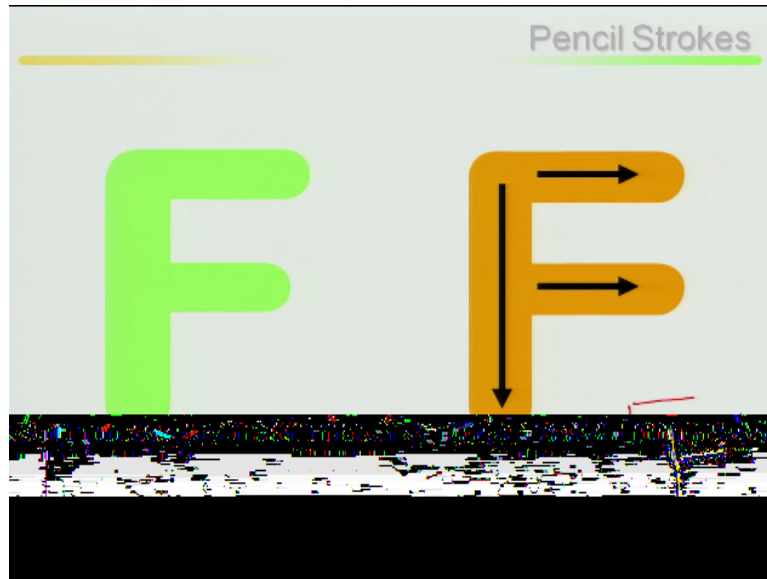
This is first one if I write it E look at very carefully this way this, this, this, this is the writing particularly in engineering drawing.

(Refer Slide Time: 12:25)



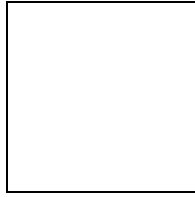
Now write it F how it follows.

(Refer Slide Time: 12:29)



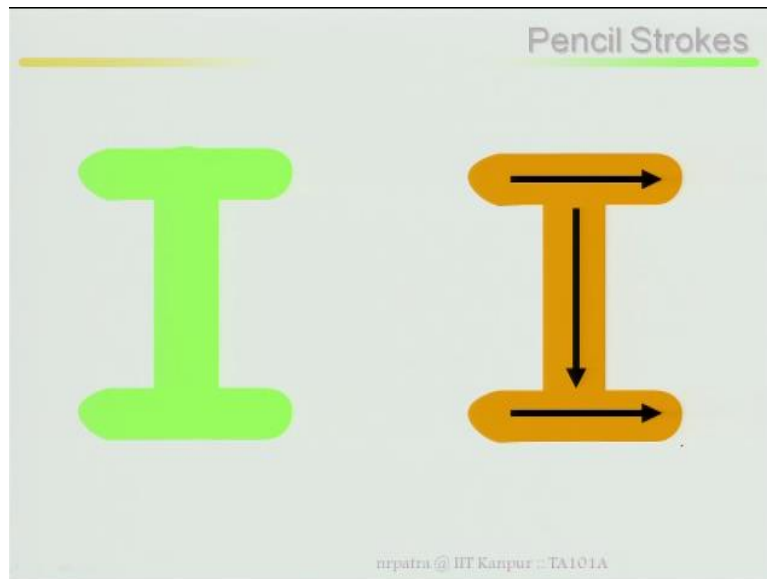
First is like this, then this, then this, so these are all sequence, these are all guidelines how to write it alphabets ABCDEF.

(Refer Slide Time: 12:36)



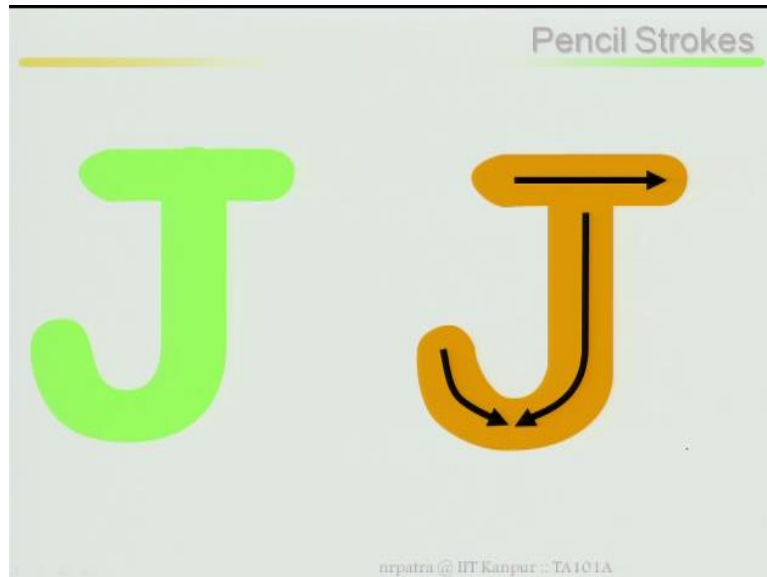
Then similarly G

(Refer Slide Time: 12:44)



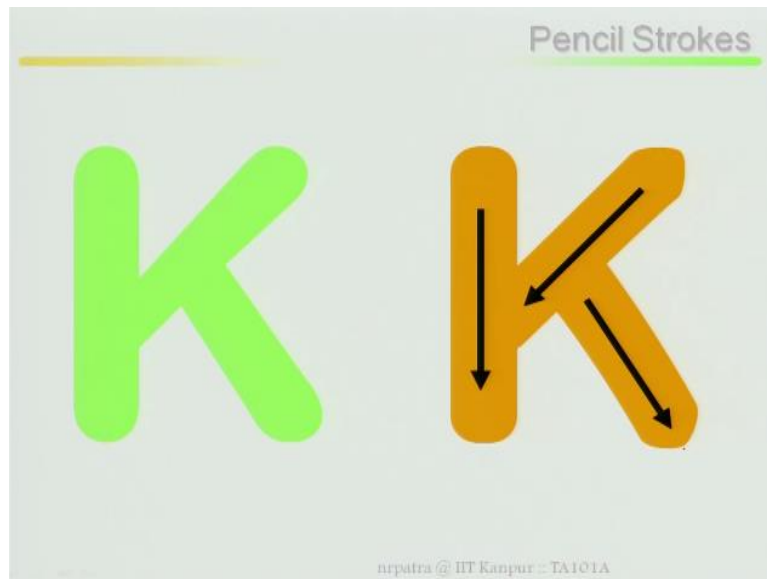
Similarly I.

(Refer Slide Time: 12:46)



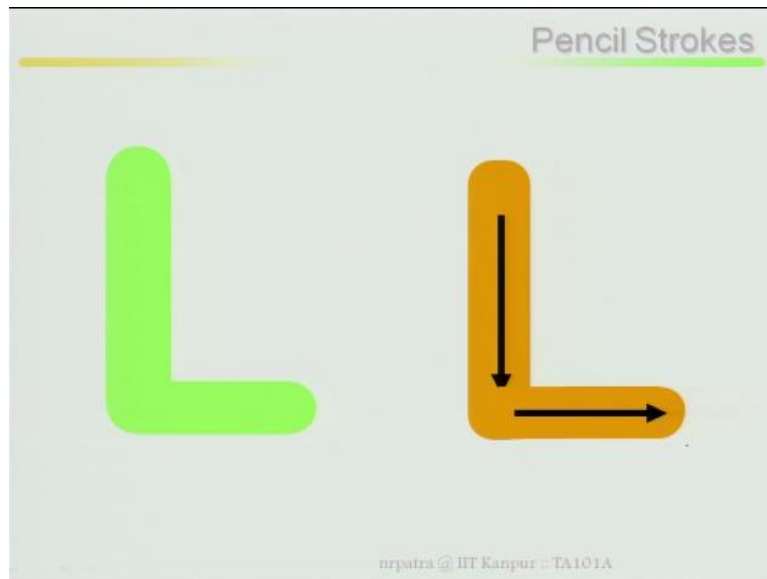
J

(Refer Slide Time: 12:49)



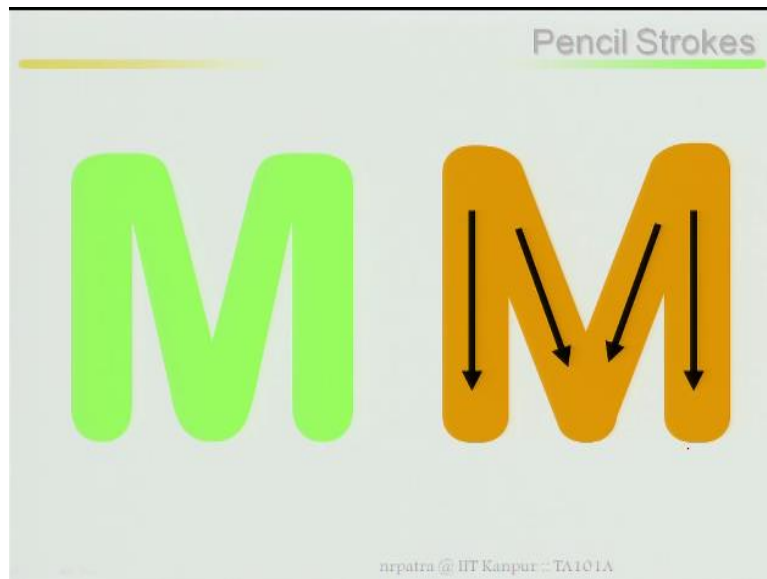
Then similarly K

(Refer Slide Time: 12:51)



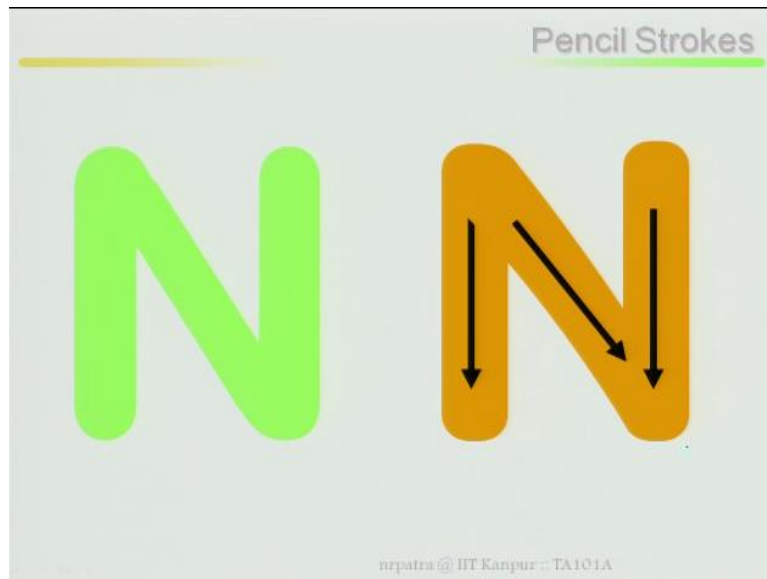
Then similarly L

(Refer Slide Time: 12:55)



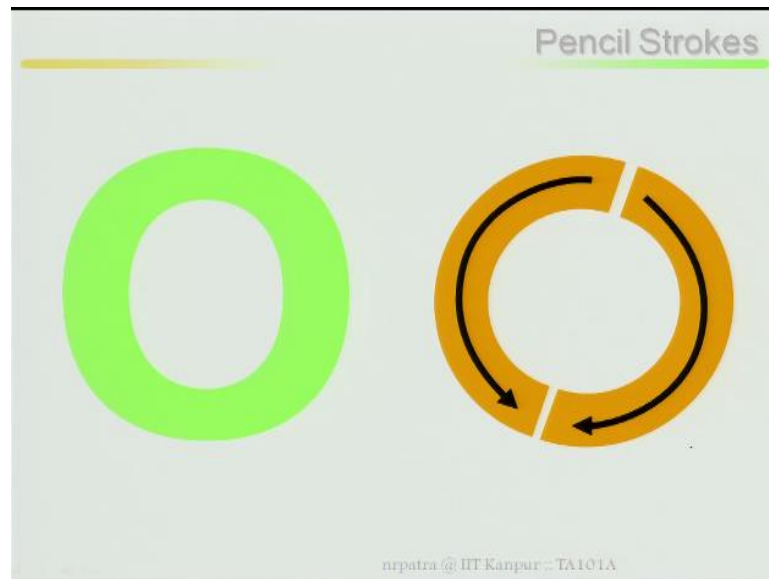
Then look at the M

(Refer Slide Time: 12:59)



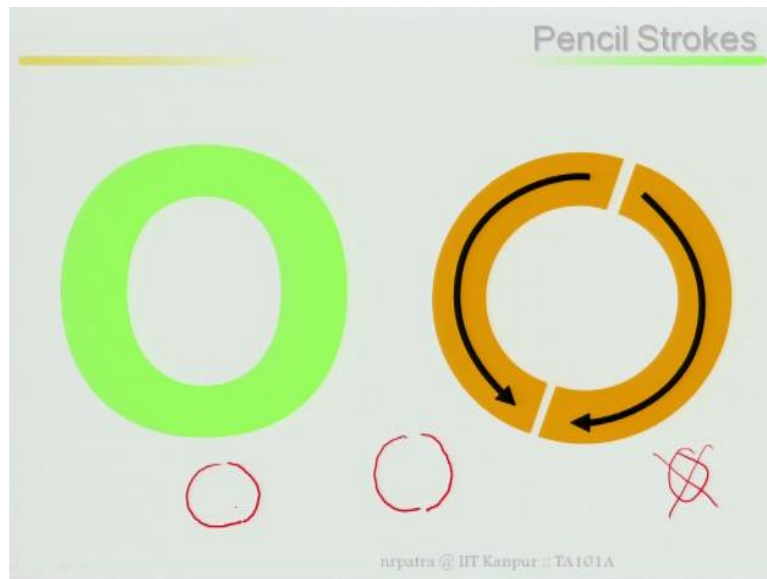
Then N.

(Refer Slide Time: 13:01)



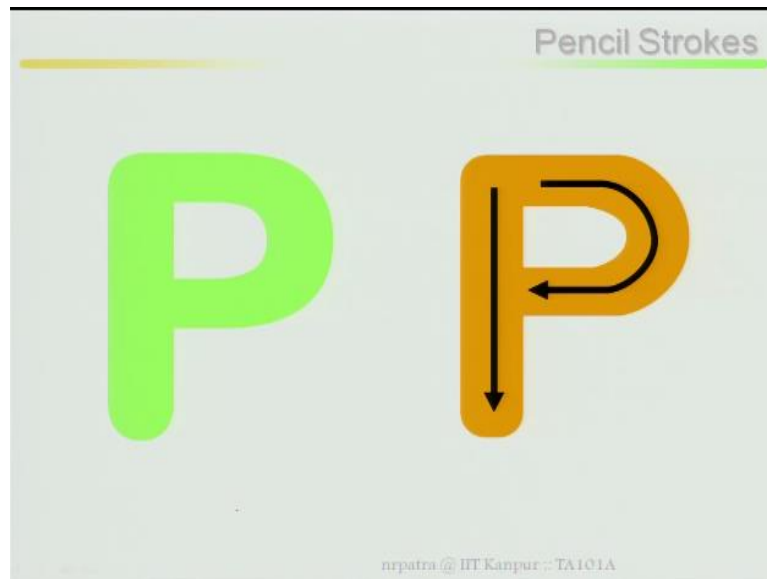
O, O is typically, its covers O is if you look at here O, first part of your O is

(Refer Slide Time: 13:11)



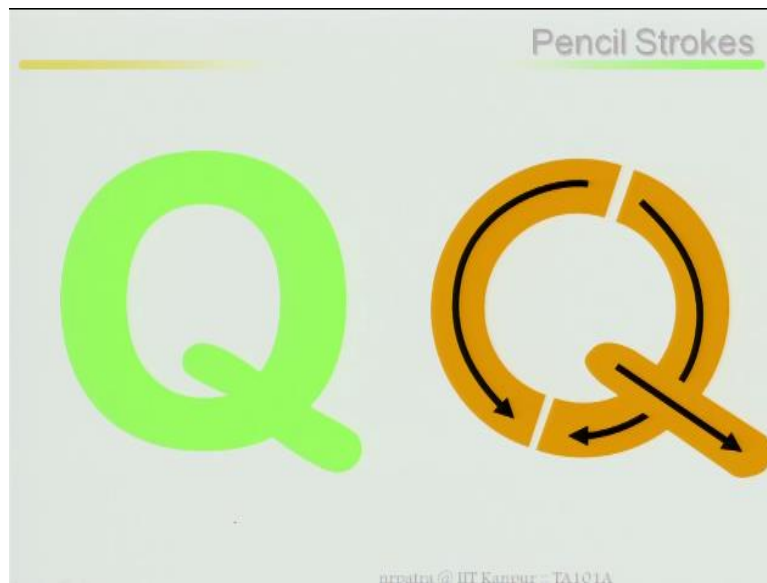
This way then completes this way, sometimes in normal practice we are writing O like this, this is as far as engineering drawing is concerned this is not correct, so you are writing O this way, then second stroke will be this way, this completes your O.

(Refer Slide Time: 13:32)



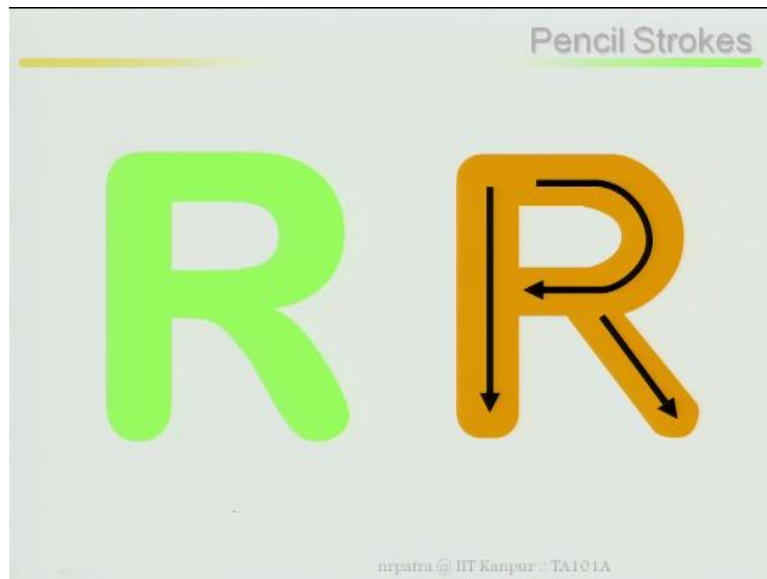
Then P, typical P

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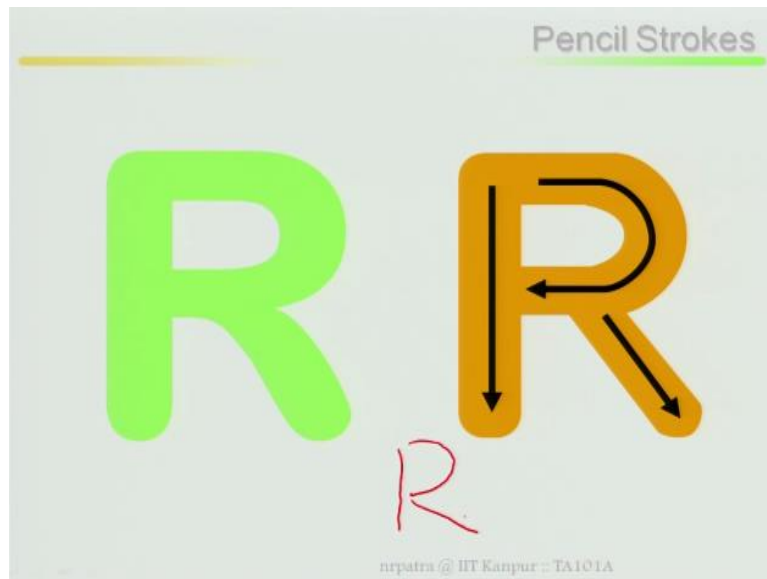
This will be easy, then Q, this will be

(Refer Slide Time: 13:42)



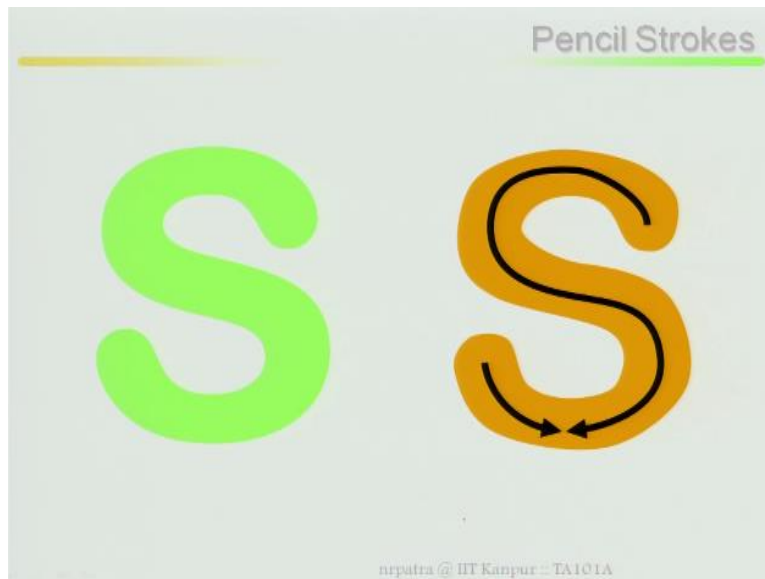
Then R, stroke one, stroke two, and stroke three, if you look at your R how do I write the R?

(Refer Slide Time: 13:51)



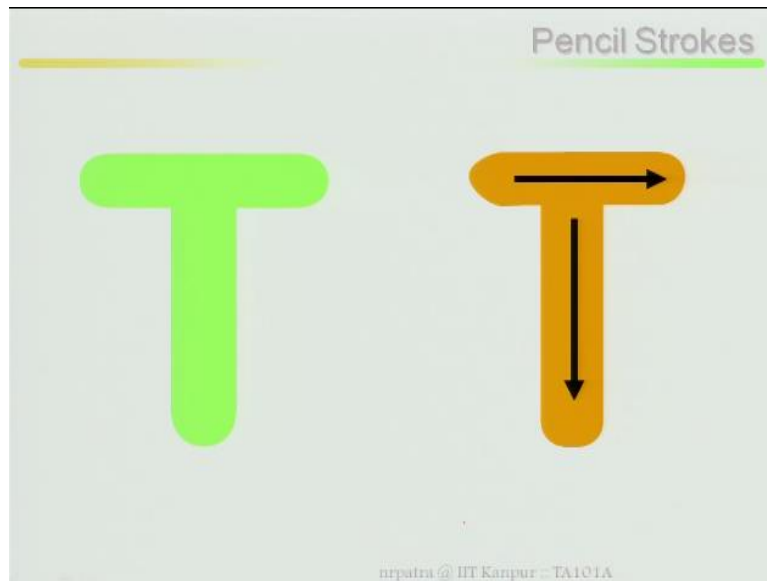
One, two, then three, sequence of your R

(Refer Slide Time: 13:59)



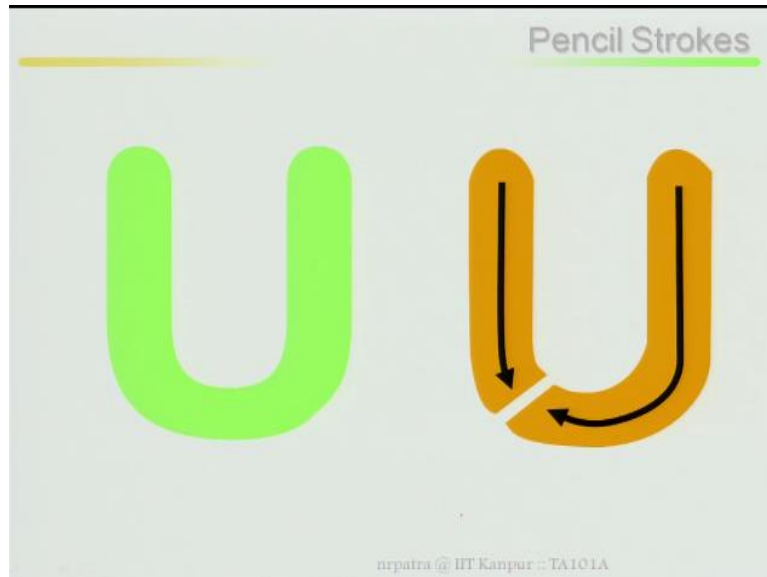
Then S

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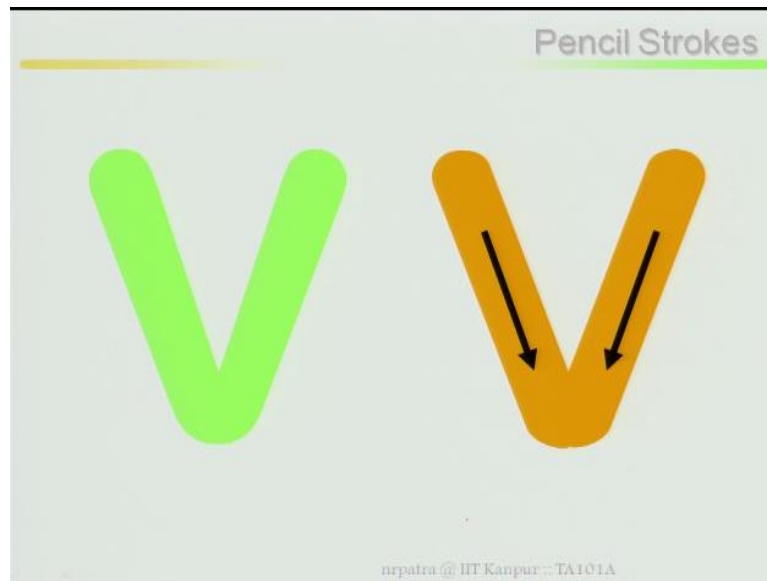
Then T

(Refer Slide Time: 14:05)



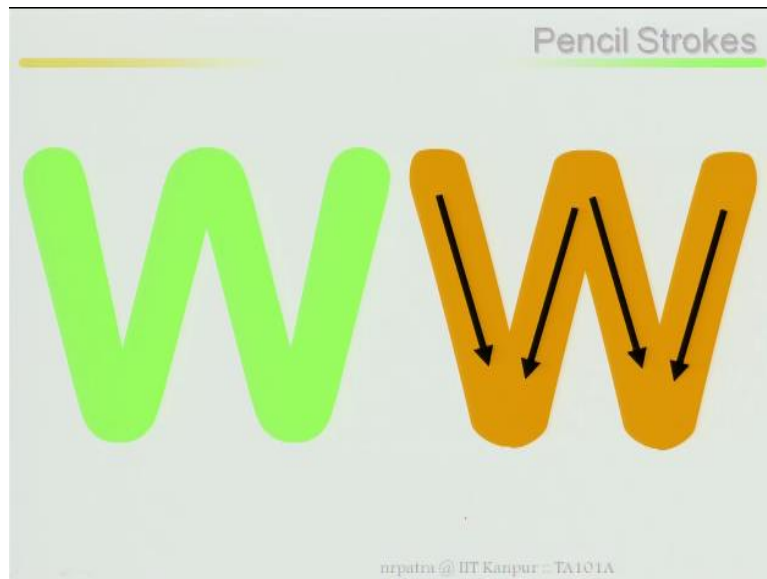
Then U

(Refer Slide Time: 14:07)



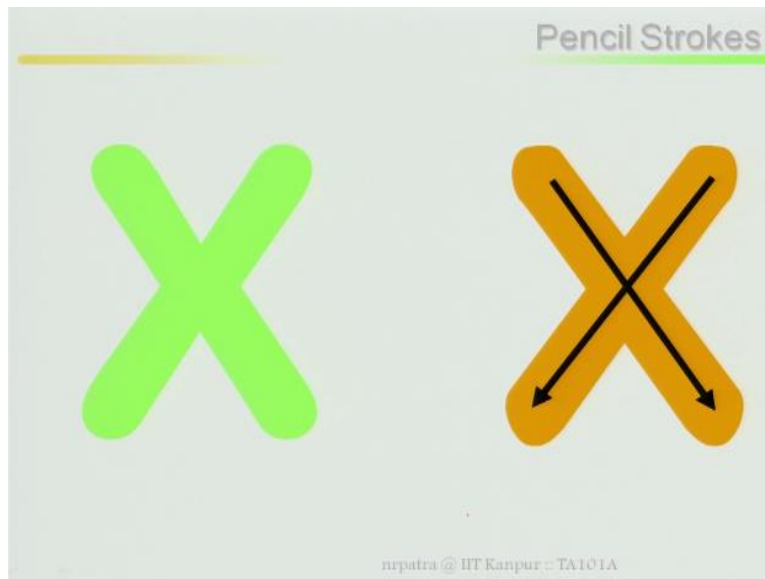
v

(Refer Slide Time: 14:09)



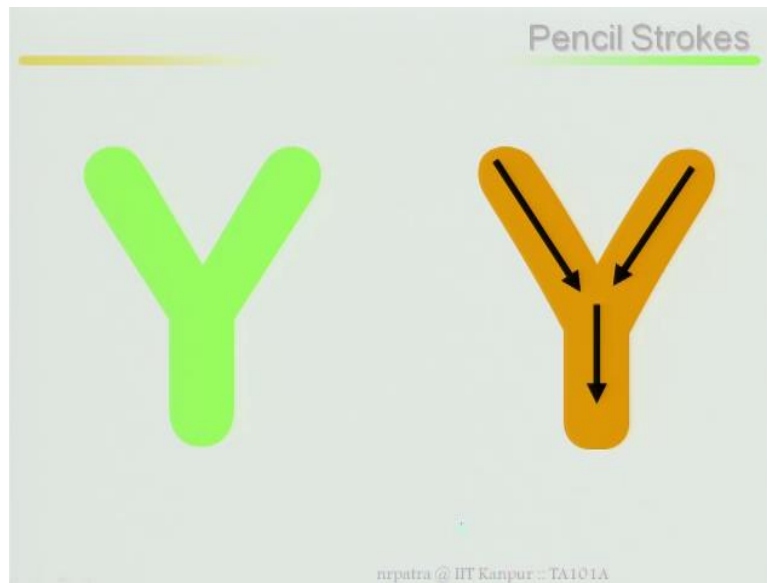
As I said W are layer, this is you are W

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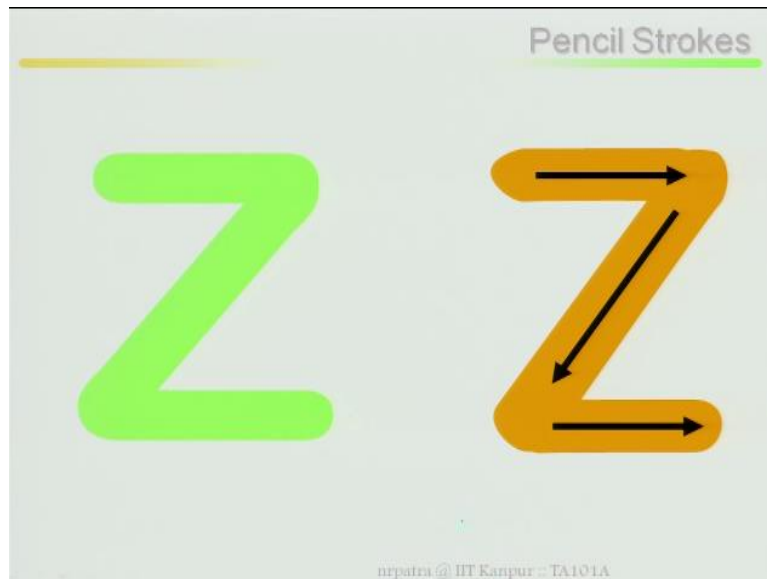
Then X

(Refer Slide Time: 14:14)



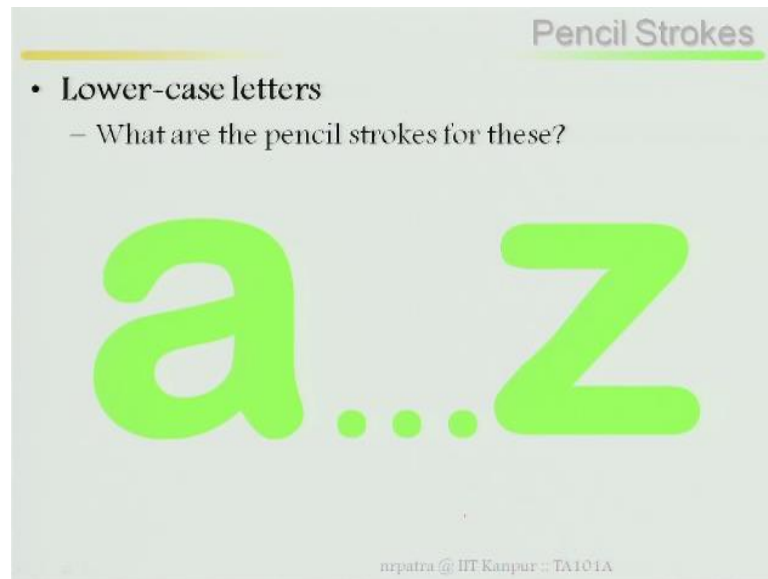
Y

(Refer Slide Time: 14:18)



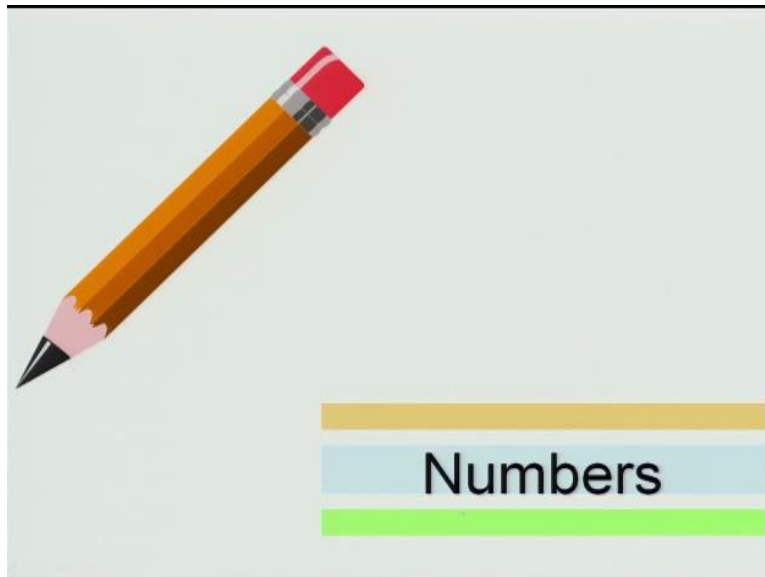
Then is your Z.

(Refer Slide Time: 14:21)



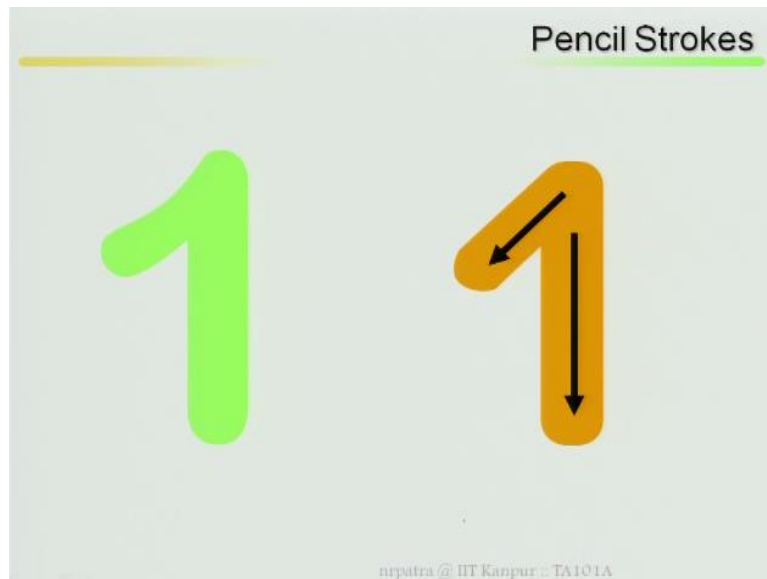
So similarly these are all your upper case, similarly lower case also you can do it for a to z, a to z for lower case.

(Refer Slide Time: 14:30)



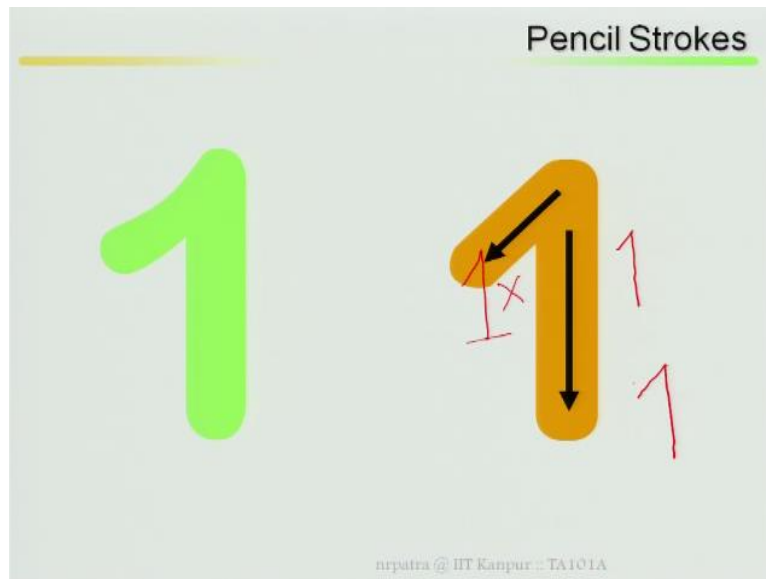
Then come to the numbers, in case of numbers.

(Refer Slide Time: 14:36)



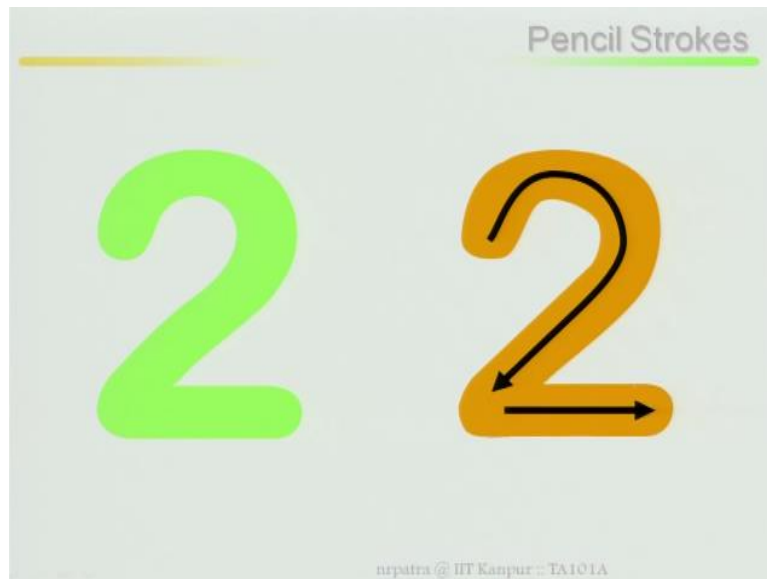
Look at how this 1, pencil strokes, first one, then second one.

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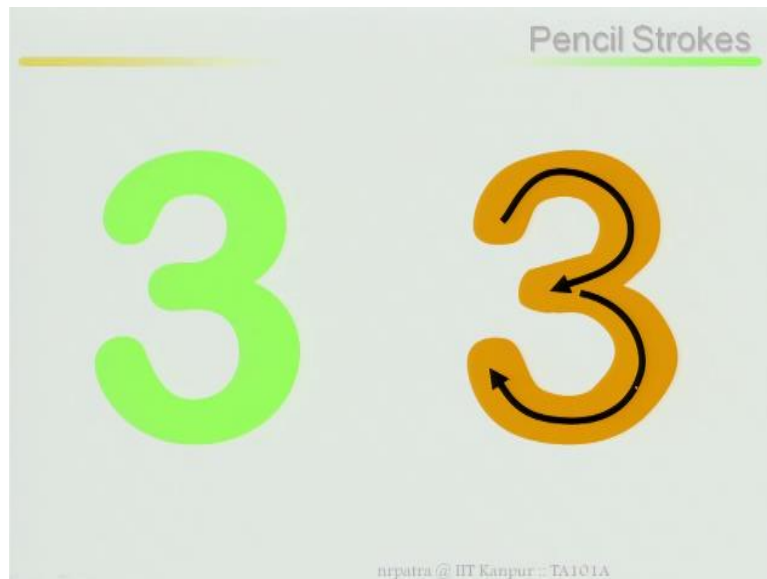
I cannot write in engineering drawing this is 1, this is wrong, it may be a normal practice to write 1 like this but the moment I am writing in pencil in engineering graphics 1 is, this shows the 1, number of strokes if you look at first this, then second this, first this then second this 1

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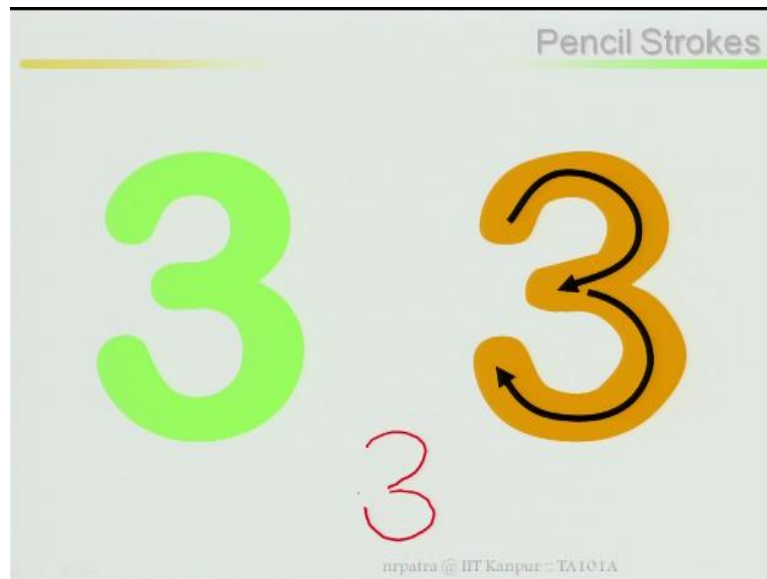
Similarly 2

(Refer Slide Time: 15:14)



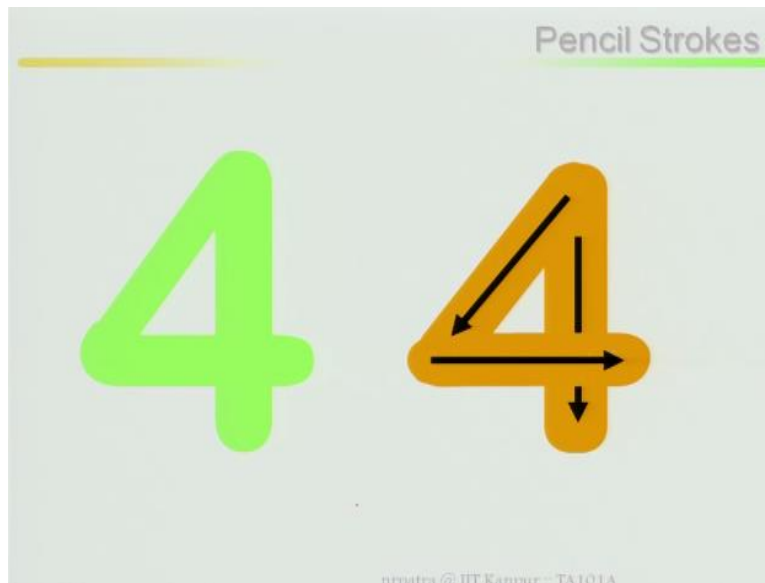
Similarly three, look at this three how it has been started, three it is going.

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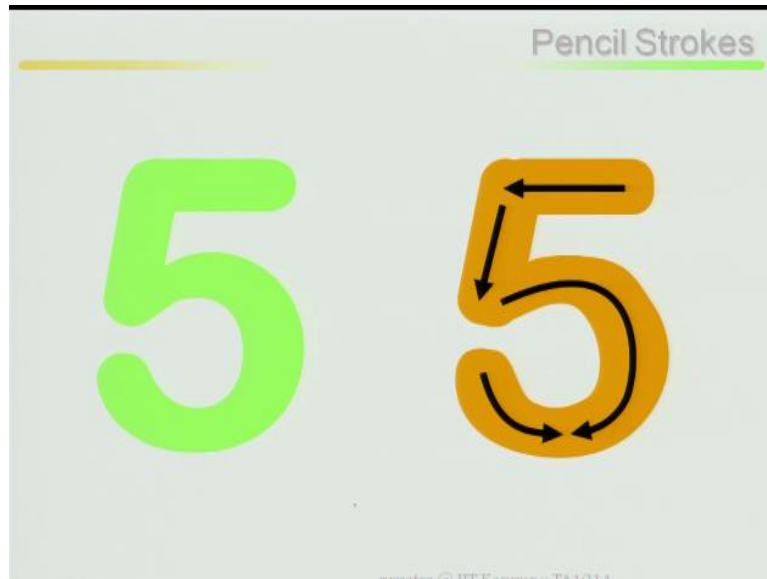


One leave it, then other second stroke is coming this, then this is your 3

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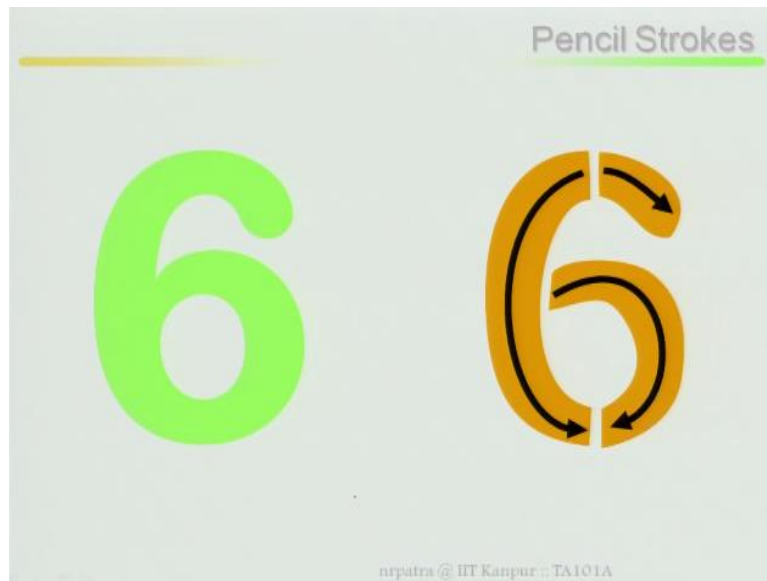


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Then 5

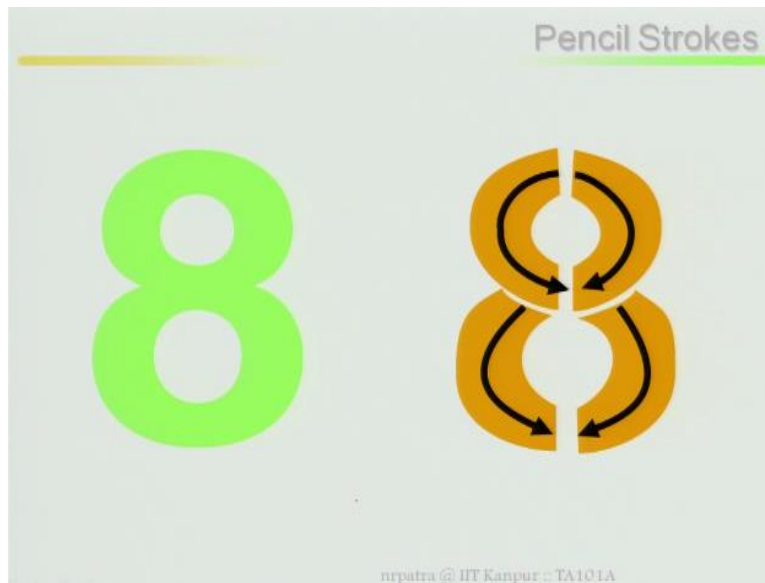
(Refer Slide Time: 15:37)



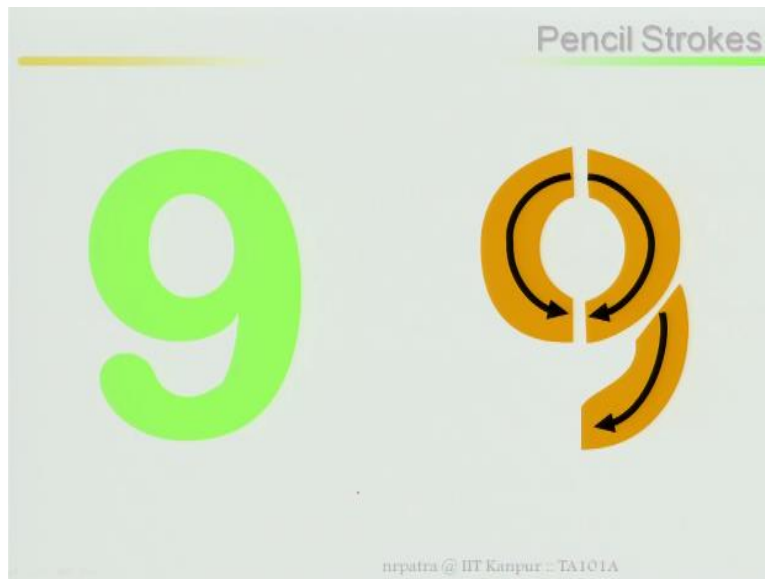
(Refer Slide Time: 15:40)



(Refer Slide Time: 15:43)

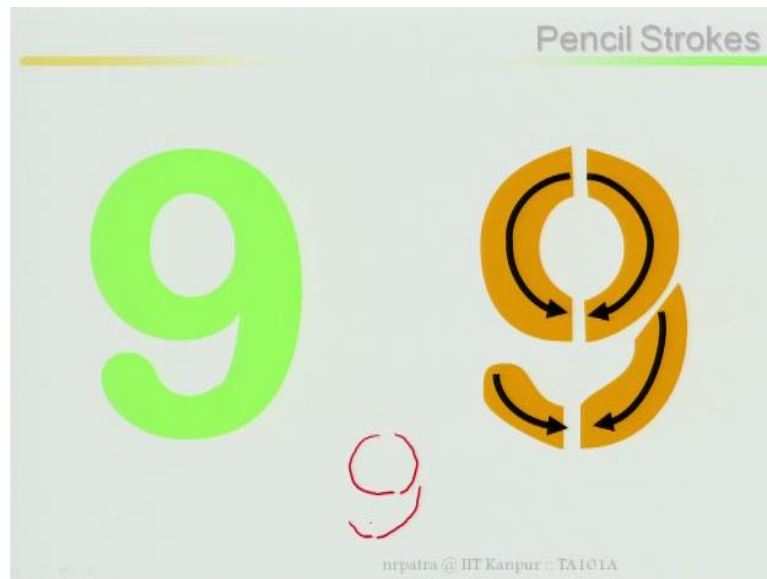


(Refer Slide Time: 15:47)



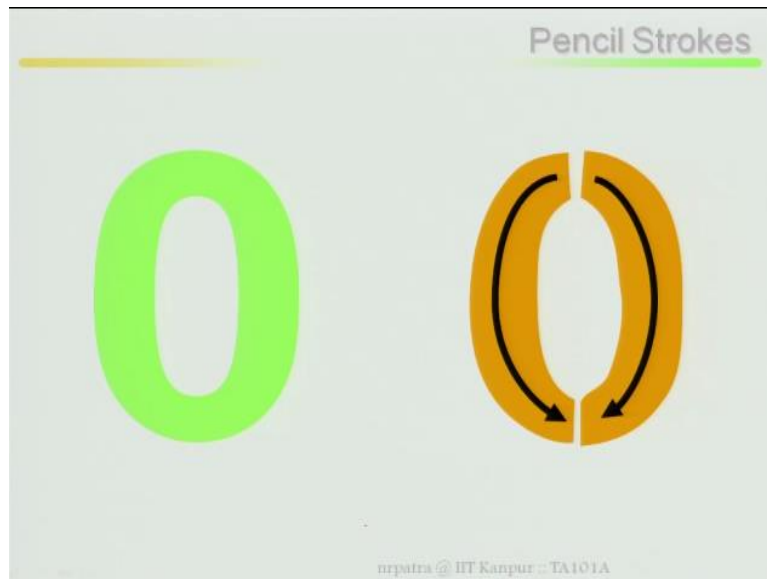
9, look at this 9, if I make it this is a complete circle, so I can make it.

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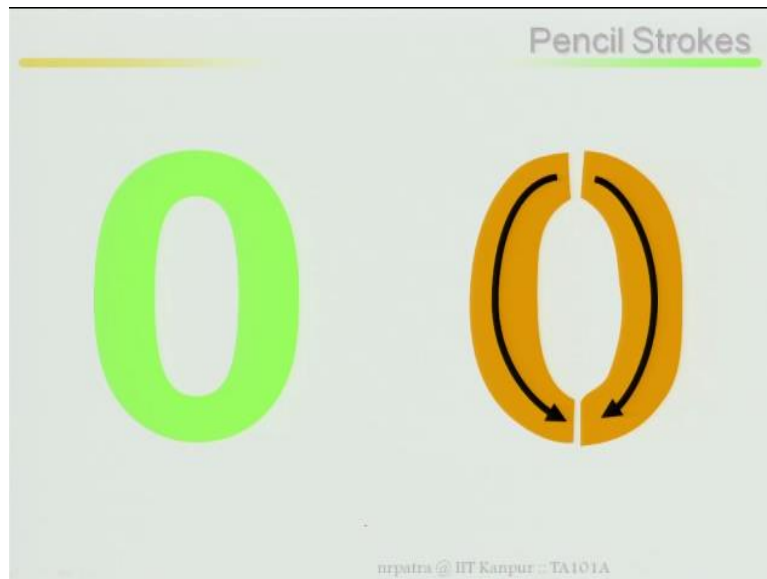
This, this, then here I will start here, then it covers by this, this completes the 9.

(Refer Slide Time: 16:09)



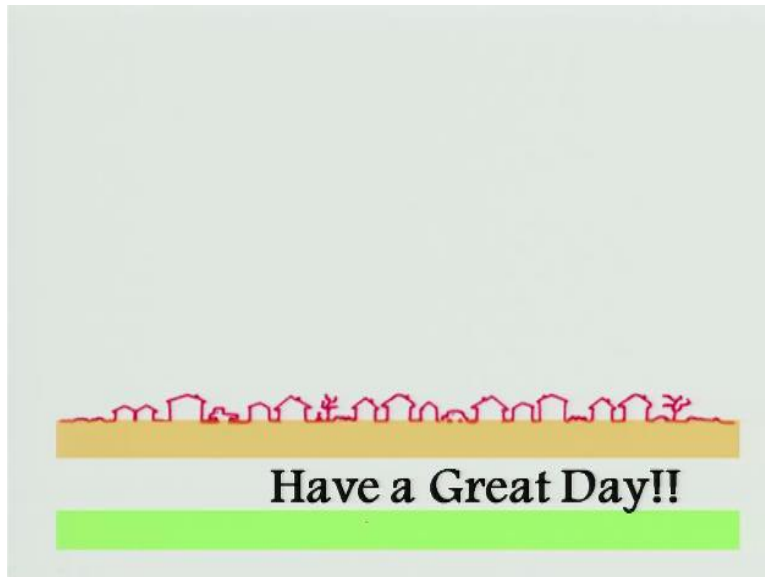
Then this is your O, so these are all requirement while doing your drawings in engineering graphics you should know this lettering because

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Once you do it at the end you may write title box, you may write question number one, you can write it projection number 1, you can write your title box name, roll number, then you have to follow not by pen, by pencil practicing you can write it your lettering so over the period of time this lettering will be practice it by yourself so as the days progress so lettering will come automatically for the way it will be for engineering graphics, thank you.

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Acknowledgement

Ministry of Human Resource & Development

Prof. Satyaki Roy

Co-ordinator, NPTEL IIT Kanpur

NPTEL Team

Sanjay Pal

Ashish Singh

Badal Pradhan

Tapabrata Das

Ram Chandra

Dilip Tripathi

Manoj Shrivastava

Padam Shukla

Sanjay Mishra

Shubham Rawat

Shikha Gupta

K. K. Mishra

Aradhana Singh

Sweta

Ashutosh Gairola

Dilip Katiyar

Sharwan

Hari Ram

Bhadra Rao

**Puneet Kumar Bajpai
Lalty Dutta
Ajay Kanaujia
Shivendra Kumar Tiwari**

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