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# Request for Proposals for Translation of NPTEL & Swayam Prabha Video Transcripts

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Indian Institute of Technology, Madras  
Through  
National Programme on Technology Enhanced  
Learning (NPTEL)  
&  
Swayam Prabha

**NOTICE INVITING TENDERS FOR TRANSLATION OF NPTEL VIDEO TRANSCRIPTS TO INDIAN LANGUAGES**

<p><b>LAST DATE for receipt of Tender</b></p>	<p><b>04.08.2020 before 2.00 PM</b></p>
<p><b>Date &amp; Time of Opening of Tender</b></p>	<p><b>04.08.2020 at 5.00 PM</b></p>
<p><b>Submission of Tender</b></p>	<p><b>No physical submission in person or by post. Two separate password protected PDF documents (different password for each document) are to be submitted - one for technical bid and one for commercial bid by email to <a href="mailto:tender@imail.iitm.ac.in">tender@imail.iitm.ac.in</a> on or before 04th <u>August 2020, 2.00 PM</u>. If the file size is large it can be split into multiple files.</b></p> <p>The technical bid and commercial bid opening will happen over Google meet with the bidders participating remotely on the dates mentioned under the para <b><u>General Instructions to the Bidder</u></b>. Each bidder's file will be opened on screenshare mode and the password will be given by the bidder over chat. Each file will be verified, signed with a timestamp and will be processed further.</p> <p>The tender documents - password protected pdf files - should be sent to: <b><a href="mailto:tender@imail.iitm.ac.in">tender@imail.iitm.ac.in</a></b></p> <p><b>THE INSTITUTE SHALL NOT BE RESPONSIBLE FOR THE LATE RECEIPT OF ABOVE PASSWORD PROTECTED FILES ON ACCOUNT OF NETWORK OR ANY OTHER DELAY.</b></p>

	<p style="text-align: center;"><b>INDIAN INSTITUTE OF TECHNOLOGY MADRAS</b></p> <p style="text-align: center;"><b>Chennai 600 036</b></p> <p style="text-align: center;">Telephone: [044] 2257 9723/9798</p> <p style="text-align: center;">E-mail: tender@imail.iitm.ac.in</p>	
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The Senior Manager (Project Purchase)

**Ref:**

**NPTEL/2020/012/ANDR/LANGUAGES**

Date: 15.07.2020

**Open Tender No: NPTEL/2020/012/ANDR/LANGUAGES**

**Due Date: 04/08/2020, 2 PM**

**Pre-Bid meeting: - 22/07/2020 @ 3 PM, via Google Meet-Video Conference -**  
<https://meet.google.com/srw-kboj-azd>

**Technical Bid opening meeting on 04/08/2020, 5:00 PM via Google Meet-Video Conference-**  
<https://meet.google.com/srw-kboj-azd>

Dear sir/m'm,

On behalf of NPTEL (and Swayam Prabha), Indian Institute of Technology Madras, offers are invited for the **“Text Translation of NPTEL and Swayam Prabha Video Lecture Transcripts to Indian languages”** conforming to the specifications given in the next few pages.

**General Instructions to the Bidder**

(i) **Preparation of Bids:** - The tenders should be submitted under a two-bid system (i.e.) Technical bid and Financial bid.

(ii) **Delivery of the tender:** - Through email to [tender@imail.iitm.ac.in](mailto:tender@imail.iitm.ac.in)

Tentative Date, Time and Venue of Pre-bid Meeting:

**22nd July 2020, 03 P.M. Online meeting and the link is <https://meet.google.com/srw-kboj-azd>**

Tentative Date, Time and Venue of Opening of Technical bids:

**04th August, Tuesday, 05.00 P.M, Online meeting and the link is**

**<https://meet.google.com/srw-kboj-azd>**

Tentative Date, Time and Venue of Technical presentations by technically qualified vendors:

**05th August 2020, Wednesday, 03.00 P.M, Online meeting. Each qualified vendor will be intimated of a specific time and given a link to make the presentation.**

Tentative Date, Time and Venue of Opening of commercial bids:

**06th August, Thursday, 03.00 P.M, Online meeting. A link to join with time specified will be given later to each tech+demo qualified bidder**

**NOTE:**

**This tender includes scope for translation of content by any division of IIT Madras who has the same specifications/requirements. The vendor finalised through this tender may be used for those divisions as well.**

**Tender document fee**

**The tender document fee of Rs.1180/- (inclusive of GST @ 18%) (Non-refundable) should be paid by bank transfer. Proof of remittance has to be enclosed along with technical tender documents. The bank account details are given above. As no separate tender documents will be issued by us, the same can be downloaded from our institute website:**

**<http://tenders.iitm.ac.in> (or) <https://eprocure.gov.in/cppp/tendersearch>**

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## 1. About NPTEL

The National Programme on Technology Enhanced Learning (NPTEL), a project funded by the Ministry of Human Resource Development (MHRD), was initiated by the seven Indian Institutes of Technology (Bombay, Delhi, Guwahati, Kanpur, Kharagpur, Madras and Roorkee) and the Indian Institute of Science, Bangalore for creating video and web course contents in engineering and science. The project is coordinated by IIT Madras. ([www.nptel.ac.in](http://www.nptel.ac.in))

NPTEL has completed 17 years since inception. There are about 56000+ hours of video content and 52000+ hours of transcribed content on the NPTEL web site. Our primary objectives are to facilitate the competitiveness of Indian industry in the global markets by improving the quality and reach of engineering education and make high quality learning material available to students of engineering institutions across the country, free of cost. Using the services of vendors, NPTEL has been providing accurately transcribed text files with video images of all NPTEL video lectures.

## 2. About Translation of Text Transcripts

Our aim now is to translate NPTEL videos and Swayam Prabha in Indian languages.

We are looking to receive 32000 hours of translated video lectures, currently available with us in English language . These translations will be across 8 languages - **Hindi, Bengali, Telugu, Marathi, Tamil, Kannada, Gujarati, and Malayalam. The number of hours translated in each language need not be the same.**

The process will involve:

- Translating text from English to the Indian language
- Retaining technical terms, slides and equations in English itself
- Checking for technical accuracy by experts of the language.

Vendor needs to generate 5 sets of translated files as follows:

1. Monolingual DOC file - contains only the translated version of the English transcript **See Annexure-7**
2. Bilingual DOC file - contains both English and translated content I.e., one line in English and the same line translated in regional language to be given below **See Annexure-8**
3. PDF of Monolingual doc file
4. Audio of Monolingual file in MP3 format
5. Index page for translated content See Annexure-6

### 3. IMPORTANT CONDITIONS OF THE TENDER

1. **Last Date:** The last date for the submission of the tender is **2 P.M. on August 04th, 2020**. In the event of this day being declared as a holiday, the tenders can be submitted up to 3:00 p.m. on the following working day.
2. **Two-bid system:** The offers / bids should be submitted in two bids systems (i.e.) Technical bid and Financial bid. The Technical bid should consist of all technical details / specifications only. The Financial bid should indicate item-wise price for each item and it should contain all Commercial Terms and Conditions including Taxes, payment terms, pricing terms etc. The Technical bid and Financial bid should be put in separate password protected pdf files. The files should be named CompanyName\_Translation\_TechnicalBid, and CompanyName\_Translation\_FinancialBid.
3. **EMD:** - EMD of Rs. 6,25,000 per language to be bid has to be paid by means of bank transfer. Eg. if the tenderer bids for 4 languages then EMD will be Rs. 25,00,000 . The bank a/c details are given below.

(i)The EMD (Bid Security) will be refunded to the Successful bidder on receipt of Bank Guarantee and also unsuccessful bidders.

(ii)The Bank Guarantee should be valid for the period of 12 months from the date of Completion of work.

#### The bank account details are:

<b>Institution Account Name</b>	The Registrar, Indian Institute of Technology - Madras
<b>Account No</b>	2722101003872
<b>Account Print Name</b>	The Registrar, IIT Madras
<b>IFSC CODE</b>	CNRB0002722

<b>Bank Name (in full)</b>	CANARA BANK
<b>Branch Name</b>	IIT -Madras Branch
<b>Complete Branch Address</b>	Canara Bank
	IIT -Madras Branch
	IIT -Madras Campus Post Office
	Sardar Patel Road
	Guindy, Chennai - 600 036
<b>MICR No.</b>	600015085
<b>Account Type</b>	Savings Account

4. **Performance Security:-** The successful bidder should submit Performance Security for an amount of 5% of the value of the contract/supply. The Performance Security may be furnished in the form of an Account Payee DD, FD Receipt from the commercial bank, Bank Guarantee from any nationalized bank of India will be an acceptable. **Only after submission of Performance Security, Purchase Order/Work Order will be released / L.C will be opened.**

**Performance Security in the form of Bank Guarantee:-** In case the successful bidder wishes to submit Performance Security in the form of Bank Guarantee, the Bank Guarantee should be routed through the Beneficiary Bank to the end user bank. Otherwise, the Indian Agent of the foreign vendor has to submit a Bank Guarantee from a Nationalized Bank of India.

The Bank Guarantee should remain valid for a period of sixty days beyond the date of completion of all contractual obligations of the supplier including the warranty obligations.



5. If an Indian agent is involved, the following documents must be enclosed:

Foreign principal's proforma invoice indicating the commission payable to the Indian Agent and nature of after-sales service to be rendered by the Indian Agent.

- i) Copy of the agency agreement with the foreign principal and the precise relationship between them and their mutual interest in the business.
  - ii) The enlistment of the Indian agent with Director General of Supplies & Disposals under the Compulsory Registration Scheme of Ministry of Finance.
6. **Risk Purchase Clause:-** In the event of failure of submitting deliveries within the stipulated delivery schedule, the purchaser has all the rights to purchase the item from other sources on the total risk of the supplier under risk purchase clause.
7. **Delivery Schedule:** - The tenderer should indicate clearly the time chart for completion of 25%, 50%, 75% and 100% of work, within stipulated time. In case there is any delay in the completion of the work, liquidated damages clause will be enforced or penalty for the delayed supply period will be levied.
8. **Payment:** - No Advance payment will be made. Installment payments after 25%, 50%, 75% and 100% of satisfactory completion of work will be made.
9. **Validity of offer:** - Tenderers shall agree to keep the tender open for ninety (90) days from the due date of submission thereof and not make any modifications in the stated terms and conditions.
10. **Bid validity :-** Valid for a period of 2 years and 4000-5000 hours of translation of video lectures, which can be extended for another year with mutual consent. Purchase order will be released periodically on satisfactory completion of earlier work and availability of videos for translation.
11. **Late offer:** - The offers received after the due date and time will not be considered and the same will be returned unopened to the respective tenderers. The Institute shall not be responsible for the late receipt of Tender on account of network related delay.
12. **Acceptance and Rejection:** - I.I.T Madras has the right to accept the whole or any parts of the Tender, or portion of the quantity offered, or reject it in full, without assigning any reason.
13. **Opening of the Tender:** The bids will be opened by the Tender Committee duly constituted for this purpose, in the presence of such Tenderers or their authorized representatives, who choose to be present at the online meeting , at the appointed time and date .
14. **Disputes and Jurisdiction:** -

a. **Settlement of Disputes:** Any dispute, controversy or claim arising out of or in connection with this Tender including any question regarding its existence, validity, breach or termination, shall in the first instance be attempted to be resolved amicably by both the Parties. If attempts for such amicable resolution fails, or no decision is reached within 30 days, whichever is earlier, then such disputes shall be settled by arbitration in accordance with the Arbitration and Conciliation Act, 1996. Unless the Parties agree on a sole arbitrator, within 30 days from the receipt of a written request by one Party from the other Party to so agree, the arbitral panel shall comprise of three arbitrators. In that event, the supplier will nominate one arbitrator and the Project Coordinator of IITM shall nominate one arbitrator. The Dean IC&SR will nominate the Presiding Arbitrator of the arbitral tribunal. The arbitration proceedings shall be carried out in English language. The cost of arbitration and fees of the arbitrator(s) shall be shared equally by the Parties. The seat of arbitration shall be at IC&SR IIT Madras, Chennai..

b. **The Applicable Law:** This Purchase Order shall be construed, interpreted and governed by the Laws of India, Court at Chennai shall have exclusive jurisdiction subject to the arbitration clause.

c. Any legal disputes arising out of any breach of contract pertaining to this tender shall be settled in the court of competent jurisdiction located within the city of Chennai in Tamil Nadu.

15. All Amendments, time extension, clarifications etc., will be uploaded on the website only and will not be published in newspapers. Bidders should regularly visit the above website - <https://tenders.iitm.ac.in/> to keep themselves updated. No extension in the bid due date/ time shall be considered on account of delay in receipt of any document by mail.

16. **Acknowledgement:** - It is hereby acknowledged that the tenderer has gone through all the conditions mentioned above and agrees to abide by them.

**4. Eligibility condition:**

For each language, submission of content in all 4 formats, is the minimum technical eligibility for that language (each language evaluation will be treated independently):

- a. Monolingual DOC
- b. Bilingual DOC
- c. Monolingual PDF
- d. Monolingual MP3

**5. Technical evaluation will be based on the following criteria.**

**Score Model:**

<b>No.</b>	<b>Criteria/Description</b>	<b>Score/Points</b>
1	Prior experience (translation of scientific content of 2000 hours or greater in the last 3 years)  Anything less will be correspondingly prorated (Technical Compliance sheet given below & Annexure 10)	30
2	Marks given by the expert committee for Quality of the translation	50
3	Last 3 years financial information as per Annexure 11	10
4	Organizational structure as per Annexures 12 & 13	10

**Total Maximum Score = 100 points**

**Minimum cutoff for successful technical qualification is 70%**

**TECHNICAL COMPLIANCE SHEET**

Language	Submit content in all 4 formats (Y/N) (2)	Translation of Scientific content of 2000 hrs or more in last 3 years (Total Number of hrs) (3)	Links to Sites with respect to column 3 If there is no link, say Not Applicable (4)
Bengali			
Gujarati			
Hindi			
Kannada			
Malayalam			
Marathi			
Tamil			
Tamil			

The above compliance sheet is to be enclosed along with the other technical bid documents mentioned herein (Annexures 9, 10, 11, 12, 13 ) in a separate password protected file subscribed as 'NPTEL-TRANSLATION - TECHNICAL BID-"COMPANYNAME"'.

**6. Commercial Evaluation**

**The commercial bids of only those bidders who have been found to be technically eligible (with scores higher than 70 points from Technical evaluation) by the constituted committee shall be opened.** The commercial bids shall be opened in the presence of the eligible bidders' or

their representatives.

**Financial bid in the following format should be placed in a separate password protected file superscribed as 'NPTEL-TRANSLATION - FINANCIAL BID-"COMPANYNAME"'.**

**NOTE :** Each lecture hour on average will have 7500 words.

(Example: <https://nptel.ac.in/courses/106/106/106106145/>)

Item	Language	Cost
Translation of one hour content	Bengali	
Translation of one hour content	Gujarathi	
Translation of one hour content	Hindi	
Translation of one hour content	Kannada	
Translation of one hour content	Malayalam	
Translation of one hour content	Marathi	
Translation of one hour content	Tamil	
Translation of one hour content	Telugu	

## 7. Final Evaluation

NPTEL may decide to offer the job to more than one bidder only on the condition that he/she agrees to the lowest commercial bid quoted by L1 bidder.

## 8. Bid Disqualification: The proposal is liable to be disqualified in the following cases:

- Proposal not submitted in accordance with this document and in proper formats.
- During validity of the proposal, or its extended period, if any, the bidder changes his quoted prices.
- Proposal is received in incomplete form.
- Proposal is received after due date and time.
- Proposal is not accompanied by all requisite supporting documents
- Information submitted in technical proposal is found to be misrepresented, incorrect or false, accidentally, unwittingly or otherwise, at any time during the processing of the contract (no matter at what stage) or during the tenure of the contract including the extension period if any.

- Financial proposal is enclosed with the same envelope as technical proposal
- Bidder fails to deposit the Bid security or fails to enter into a contract within specified date of notice of award of contract or within such extended period, as may be specified by Institute

**SIGNATURE OF THE TENDERER ALONG WITH SEAL OF THE COMPANY WITH DATE**

**Annexure – 1: List of Indian languages for translation**

**Transcripts of 4000 hours of video lectures in English will be provided which has to be translated in the following languages**

- Bengali
- Gujarati
- Hindi
- Kannada
- Malayalam
- Marathi
- Tamil
- Telugu

## Annexure – 2: DESCRIPTION OF WORK

**Scope of work** Conversion of transcripts of NPTEL video lectures in English into 8 Indian languages. See list of languages in Annexure-I. Purchase Orders will be released periodically based on the availability of NPTEL video course transcripts.

### **Description of task**

- Text transcripts in English will be provided as input for this translation process. (Google Drive link will be shared)
- Translating text from English to the Indian language
- Description of the translation is specified in guideline doc ( Refer **Annexure-3**)
- Translated content has to be provided in 4 formats (Monolingual DOC, Bilingual DOC, Monolingual PDF, Monolingual MP3) for each lecture. Details are provided in **Annexure-3**
- Index of content and glossary has to be provided as mentioned in guideline document (Refer **Annexure-5, Annexure-6** )
- All translated contents have to be uploaded to the respective shared Google drive folder.
- After each lecture upload, Google form has to be submitted (Google form link is in **Annexure-3**)
- Our quality controller (QC) will review the submitted content and provide comments. All the comments have to be resolved. Only on approval of the QC, we will consider the translation process as successfully completed. The QC's word will be taken as final.

### **Deliverable**

1. Monolingual DOC file - contains only the translated version of English transcript (Refer **Annexure-7**)
2. Bilingual DOC file - contains both English and translated content i.e., one line in English and below same line is translated in regional language (Refer **Annexure-8**)
3. PDF of Monolingual doc file
4. Audio of Monolingual file in MP3 format
5. Index of the translated content

### **Source material**

Text transcripts in English will be provided by NPTEL as input for this translation process.

### **Delivery Schedule**

Approximately **4000 hours of video lectures** in engineering / science subjects to be processed within 3 months from the date of issue of P.O. , **for each language** for which the tender is awarded to a given vendor.

### **Quality Check**

Quality Check of deliverable should be done at your end. NPTEL will also conduct one round of quality check. If the submitted work does not meet our standards, re-work to be done at your end.



### **Payment**

Installment payments will be made after 25%, 50%, 75% and 100% of satisfactory completion of work.

### **Apportion of work**

In the event more than one vendor is found technically qualified, IIT Madras reserves the right to apportion the work based on the experience of the vendor and the quality of the sample provided. Work will be allocated to these vendors based on the quality of their work and completion of allocated work within mutually agreed timelines.

**For the purpose of awarding the contract, each language will be considered independently. Therefore, vendors must quote rates for each language independently.** To enable this, one sample translated file in all languages for which rates are quoted must be submitted along with the tender. The sample English transcript is available in **Annexure-9**. Apportion of work has to include “quality of work in time bound”

### **Details of past work**

Details of past work to be provided along with tender including:

- Links to sites where at least 50 hours of translated work in one or more languages are published, ideally of science content
- Time frame within which the work was completed

### **Samples for reference**

Please refer to **Annexure-4**

**To be submitted along with Tender** - sample translated files in all languages for which rates are quoted must be submitted in the 4 formats as mentioned in Annexure - 9, along with the Technical tender.

### Annexure-3: Translation Guidelines

#### Process of translation

1. **Vendor:** Translate the English lectures; Share with NPTEL as per agreed upon process.
2. **NPTEL:** Upon receiving the translation, QC will be done and comments will be shared.
3. **Vendor:** Depending on the QC comments, corrections to be carried out and files to be re-uploaded.
4. **Vendor** has to hand over the following to NPTEL
  - a. Translated Transcript document (Bilingual document and translated monolingual document)
  - b. PDF for each lecture (monolingual document)
  - c. Index page as shown in **Annexure-6**
  - d. MP3 file

#### Points to be noted in Translated files

1. Check the English lecture and translate the lecture files into the regional language in a Google doc.
2. Ensure there are no grammatical and spelling errors, while translating.
3. Insert Math symbols and equations in the correct format.
4. The meaning should be properly conveyed. Language usage : Colloquial/Not formal
5. The technical terms should not be translated. Maintain the technical terms in transliterated format and mention corresponding English words in parentheses e.g., विंडिंग (windings) .
6. Include a glossary at the end of the document showing technical words with transliteration, translation and corresponding English word. (Page No: 16-18)
7. Insert screenshot/slides in the language document from the English file, No need to translate screenshots
8. Translated material should be delivered as Doc & PDF.
9. Delivery of translated files is expected to be completed within the stipulated timeline.
10. We have shown 2 examples each for all the languages (Hindi, Bengali, Gujarati, Kannada, Malayalam, Marathi, Tamil, Telugu) for your reference. (Annexure-4 )
11. After the translation of each lecture Index page has to be created with lecture names (Annexure-6)

12. Follow the below specification while uploading the files and also ensure the style which is maintained in English lectures:
13. Font style : Regular,Font size : 12,Format-Align: Justified, Line spacing - 1.15 line
14. Lec naming should be followed as - lec1, lec2, lec3 .....
15. If lecture name is missing in the English transcript file, translate and keep the lecture name in each translated lecture
16. The title part of each lecture should be bold and center aligned. Given below is the example in English for your reference. Keep translated title in the below format

**Human Adjustment Process**  
**Prof. Braj Bhushan**  
**Department of Humanities & Social Sciences**  
**Indian Institute of Technology, Kanpur**  
**Lecture - 1**  
**Who and what matters**

**Submit files and obtain feedback**

1. After uploading each lecture, the vendor has to submit the completion status of the lecture via a mutually agreed upon process.
2. The comments entered by the QC person should be addressed suitably by the vendor to NPTEL's satisfaction before final submission.

**Disclaimer:** All translated content is copyrighted to NPTEL and the translator cannot make any claim to be the author of this or use it for any commercial purposes

## Annexure 4- Sample of translated content

### Hindi

#### English

So could you please explain us about this Bragg's reflector.' and also the kind of virtual problem we are looking at taking the physical problem and modelling it on a virtual environment. So in the first example we are modelling a Bragg's reflector. This is nothing but a dielectric mirror. So dielectric mirror means it reflects incident energy; so whichever wave is incident in coming, part of it will be reflected and this is required for applications where in we need our beam to beam switching between some points. So basically what we are doing is we are staggering slabs of dielectric constants and kind of we are trying to stack them up so light is going to come and it is going to be reflected.

#### Translated in Hindi - Sample 1

तो क्या आप कृपया हमें इस ब्रैग रिफ्लेक्टर (Bragg's reflector) के बारे में समझा सकते हैं। 'और यह भी आभासी समस्या है कि हम भौतिक समस्या को लेने और आभासी वातावरण पर मॉडलिंग (modelling) करने के लिए देख रहे हैं। तो पहले उदाहरण में हम ब्रैग रिफ्लेक्टर को मॉडलिंग (modelling a Bragg's reflector) कर रहे हैं। यह एक डाईलेक्ट्रीक मिरर (dielectric mirror) के अलावा कुछ भी नहीं है। तो डाईलेक्ट्रीक मिरर (dielectric mirror) का मतलब है कि यह इन्सिडेन्ट एनर्जी (incident energy) को दर्शाता है; इसलिए जो भी वेव (wave) आने में घटना है, इसका हिस्सा रिफ्लेक्टेड (reflected) होगा और यह उन अनुप्रयोगों के लिए आवश्यक है जहां हमें कुछ बिंदुओं के बीच बीम स्विचिंग (switching) के लिए हमारी बीम की आवश्यकता होती है। तो मूल रूप से हम जो कर रहे हैं वह है कि हम ढांकता हुआ स्थािरांक के स्लैब हैं और हम किस तरह से उन्हें स्टैक (stack) करने की कोशिश कर रहे हैं ताकि प्रकाश आने वाला है और यह परिलक्षित होने जा रहा है।

#### English

The linear system response of course is fully known in terms of simple functions like exponents and sinusoids .We can use our powerful Eigen analysis tools to obtain Eigen values and Eigen vectors and write down the system response. There is no need to do integration. But, as I mentioned some time back that we use these two benchmark how our numerical integration, numerical methods work.

#### Translated in Hindi - Sample 2

निश्चित रूप से लीनियर सिस्टम रेस्पॉन्स (linear system response), एक्सपोनेन्ट्स (exponents) और साइनसाइड (sinusoids) जैसे सरल कार्यों के संदर्भ/मामले में पूरी तरह से जानी जाती है। हम अपने शक्तिशाली आइगेन एनालिसिस (Eigen analysis) उपकरण का उपयोग आइगेन वैल्यूज़ (Eigen values) और आइगेन वेक्टर्स (Eigen vectors) को प्राप्त करने और सिस्टम रेस्पॉन्स (system response) लिखने के लिए कर सकते हैं। इंटीग्रेशन (integration) करने की कोई जरूरत नहीं है। लेकिन, जैसा कि मैंने कुछ समय पहले उल्लेख किया था कि हम इन दो मानकों का उपयोग करते हैं कि कैसे हमारे न्यूमेरिकल इंटीग्रेशन (numerical intergration), संख्यात्मक तरीके न्यूमेरिकल मेथेड्स (numerical methods) काम करते हैं।

## Bengali

### English

So could you please explain us about this Bragg's reflector.' and also the kind of virtual problem we are looking at taking the physical problem and modelling it on a virtual environment. So in the first example we are modelling a Bragg's reflector. This is nothing but a dielectric mirror. So dielectric mirror means it reflects incident energy; so whichever wave is incident in coming, part of it will be reflected and this is required for applications where in we need our beam to beam switching between some points. So basically what we are doing is we are staggering slabs of dielectric constants and kind of we are trying to stack them up so light is going to come and it is going to be reflected.

### Translated in Bengali - Sample 1

সুতরাং আপনি এই ব্র্যাগ'স রিফ্লেক্টর (Braggs reflector) সম্পর্কে এবং আমাদের বিভিন্ন ধরনের ভার্চুয়াল সমস্যা যাহা আমরা শারীরিক সমস্যা হিসেবে খুঁজছি গ্রহণ করতে এবং এটি একটি ভার্চুয়াল পরিবেশে মডেলিং সম্পর্কে ব্যাখ্যা করতে পারেন দয়া করে। সুতরাং প্রথম উদাহরণে আমরা একটি ব্র্যাগ প্রতিফলক (Bragg's reflector) মডেলিং হয় করছি। এটি একটি ডাইইলেকট্রিক মিরর (dielectric mirror) ছাড়া কিছুই নয়। তাই ডাইইলেকট্রিক মিরর (dielectric mirror) মানে এটি প্রতিফলিত ইন্সিডেন্ট এনার্জি (incident energy); তাই যে কোনও ওয়েভ (তরঙ্গ) আসার সময় ঘটতে পারে, এর অংশটি প্রতিফলিত হবে এবং এটি অ্যাপ্লিকেশনগুলির জন্য প্রয়োজন যেখানে আমরা আমাদের কিছু বিন্দুর মধ্যবর্তী বিম পরিবর্তন করতে প্রয়োজন। তাই মূলত আমরা কি করছি আমরা ডাইইলেকট্রিক (dielectric constants) কনস্টেন্ট (constant) এবং আমরা এক প্রকার তাদের স্ট্যাক করার চেষ্টা করছি ধরনের বিস্ময়কর স্ল্যাব হয় তাই হালকা আসতে যাচ্ছে এবং এটি প্রতিফলিত হতে যাচ্ছে।

### English

The linear system response of course is fully known in terms of simple functions like exponents and sinusoids .We can use our powerful Eigen analysis tools to obtain Eigen values and Eigen vectors and write down the system response. There is no need to do integration. But, as I mentioned some time back that we use these two benchmark how our numerical integration, numerical methods work.

### Translated in Bengali- Sample 2

রৈখিক সিস্টেম (linear system) এর কোর্স প্রতিক্রিয়া সম্পূর্ণরূপে এক্সপোনেন্টস (exponents) এবং sinusoids এর মত সহজ ফাংশন পরিপ্রেক্ষিতে পরিচিত। আমরা আইগেন ভেলুস (eigen values) এবং আইগেন ভেক্টর গুলিকে পেতে আমাদের শক্তিশালী আইগেন অ্যানালাইসিস (eigen analysis) সরঞ্জাম ব্যবহার করতে পারি এবং সিস্টেম প্রতিক্রিয়া টি লিখুন। ইন্টিগ্রেশন করার কোন প্রয়োজন নেই। কিন্তু, যেহেতু আমি কিছুক্ষণ সময় আগে উল্লেখ করেছিলাম যে আমরা এই দুটি বেসমার্ক ব্যবহার করে কিভাবে আমাদের নিউমেরিক্যাল (numerical) ইন্টিগ্রেশন, নিউমেরিক্যাল (numerical) মেথডস (methods) কাজ করে।

## Gujarati

## English

So could you please explain us about this Bragg's reflector.' and also the kind of virtual problem we are looking at taking the physical problem and modelling it on a virtual environment. So in the first example we are modelling a Bragg's reflector. This is nothing but a dielectric mirror. So dielectric mirror means it reflects incident energy; so whichever wave is incident in coming, part of it will be reflected and this is required for applications where in we need our beam to beam switching between some points. So basically what we are doing is we are staggering slabs of dielectric constants and kind of we are trying to stack them up so light is going to come and it is going to be reflected.

## Translated in Gujarati- Sample 1

તો શું તમે કૃપા કરીને આ બ્રેગના પરાવર્તક (Bragg's reflector) વિશે અમને સમજાવશો અને આ પ્રકારની વાસ્તવિક સમસ્યા વિશે પણ, જે અમે ભૌતિકસમસ્યા લેવાની અને વાસ્તવિક પર્યાવરણ પર નમૂનો તૈયાર કરવાનું જોઈ રહ્યા છીએ.. તેથી પ્રથમ ઉદાહરણમાં આપણે બ્રેગનાપરાવર્તક (Bragg's reflector) નો નમૂનો તૈયાર કરી રહ્યાં છીએ. આ એક ડાઇલેક્ટ્રિક (શૂન્યાવકાશ) મિરર સિવાય બીજું કંઈ નથી. તેથી ડાઇલેક્ટ્રિક(શૂન્યાવકાશ) મિરર (dielectric mirror) નો અર્થ એ છે કે તે ઘટના શક્તિ (incident energy) પ્રતિબિંબિત કરે છે; તેથી જે પણ તરંગ(wave)યોગાનુયોગ આવે છે, તેનો અમુક ભાગ પ્રતિબિંબિત થશે અને આ એવી જગ્યા એ જરૂરી છે કે જ્યાં આપણે કેટલાક બિંદુઓ વચ્ચે બીમ થી બીમ બદલવું છે. તેથી મૂળભૂત રીતે આપણે શું કરી રહ્યા છીએ તે છે આપણે શૂન્યાવકાશ સ્થિરતા (dielectric constants) ને સ્તરમાં વહેંચીએ છીએ અને અમે તેમને થપ્પી કરવાનો પ્રયાસ કરી રહ્યા છીએ જેથી પ્રકાશ આવવા જઈ રહ્યું છે અને તે પ્રતિબિંબિત થશે.

## English

The linear system response of course is fully known in terms of simple functions like exponents and sinusoids .We can use our powerful Eigen analysis tools to obtain Eigen values and Eigen vectors and write down the system response. There is no need to do integration. But, as I mentioned some time back that we use these two benchmark how our numerical integration, numerical methods work.

## Translated in Gujarati- Sample 2

અલબત્ત રેખાકાર સિસ્ટમની પ્રતિક્રિયા સંપૂર્ણપણે સરળ કાર્યો જેમ કે ઘાતો (exponents) અને સાઇનુસોઇડ્સ (sinusoids) ની દ્રષ્ટિએ ઓળખાય છે. આપણે આઇગન કિંમતો (Eigen values) અને આઇગન વેક્ટર્સ (Eigen vectors) મેળવવા માટે આપણા શક્તિશાળી આઇગન વિશ્લેષણ સાધનોનો ઉપયોગ કરી શકીએ છીએ અને સિસ્ટમની પ્રતિક્રિયા લખી શકીએ. સંકલન કરવાની જરૂર નથી પરંતુ, જેમ કે મેં થોડો સમય અગાઉ ઉલ્લેખ કર્યો છે કે આપણે આ બે બેનચમાર્કનો ઉપયોગ કરીએ છીએ કે કેવી રીતે આંકડાકીય એકીકરણ (numerical integration), સંખ્યાત્મક પદ્ધતિઓ (numerical methods) કામ કરે છે.

### English

So could you please explain us about this Bragg's reflector.' and also the kind of virtual problem we are looking at taking the physical problem and modelling it on a virtual environment. So in the first example we are modelling a Bragg's reflector. This is nothing but a dielectric mirror. So dielectric mirror means it reflects incident energy; so whichever wave is incident in coming, part of it will be reflected and this is required for applications where in we need our beam to beam switching between some points. So basically what we are doing is we are staggering slabs of dielectric constants and kind of we are trying to stack them up so light is going to come and it is going to be reflected.

### Translated in Kannada - Sample 1

ಹಾಗಾಗಿ ದಯವಿಟ್ಟು ನೀವು ಈ ಬ್ರಾಗ್ಸ್ ರಿಫ್ಲೆಕ್ಟರ್ ಮತ್ತು ಭೌತಿಕ ಸಮಸ್ಯೆಯನ್ನು ತಾತ್ವಿಕ ಸಮಸ್ಯೆಯನ್ನಾಗಿ ಪರಿವರ್ತಿಸಿ ಅದನ್ನು ತಾತ್ವಿಕ ಪರಿಸರದಲ್ಲಿ ರೂಪಿಸುವುದರ ಬಗ್ಗೆ ವಿವರಿಸುವಿರಾ. ಆದ್ದರಿಂದ ಮೊದಲ ಉದಾಹರಣೆಯಲ್ಲಿ ನಾವು ಬ್ರಾಗ್ಸ್ ರಿಫ್ಲೆಕ್ಟರ್ ವನ್ನು ರೂಪಿಸುತ್ತಿದ್ದೇವೆ. ಅದುವೇ ಒಂದು ಅವಾಹಕ ಕನ್ನಡಿ ಅಥವಾ ಡೈಎಲೆಕ್ಟ್ರಿಕ್ ಮಿರರ್ (Dielectric mirror). ಆದ್ದರಿಂದ ಡೈಎಲೆಕ್ಟ್ರಿಕ್ ಮಿರರ್ (Dielectric mirror) ಎಂದರೆ ತನ್ನ ಮೇಲೆ ಬಿಂಬಿತ ವಾದ ಶಕ್ತಿಯನ್ನು ಪ್ರತಿಬಿಂಬಿಸುತ್ತದೆ; ಆದ್ದರಿಂದ ಡೈಎಲೆಕ್ಟ್ರಿಕ್ ಮಿರರ್ (Dielectric mirror) ತನ್ನ ಮೇಲೆ ಬಿಂಬಿತ ವಾದ ಯಾವುದೇ ತರಂಗದ ಭಾಗವನ್ನು ಪ್ರತಿಬಿಂಬಿಸುತ್ತದೆ, ಈ ಕ್ರಿಯೆಯನ್ನು ಕಿರಣದಿಂದ ಕಿರಣಕ್ಕೆ ಬದಲಾಯಿಸುವ ಅನ್ವಯಗಳಲ್ಲಿ ಉಪಯೋಗಿಸಬಹುದು. ಆದ್ದರಿಂದ ಮೂಲಭೂತವಾಗಿ ನಾವು ಏನು ಮಾಡುತ್ತಿದ್ದೇವೆಂದರೆ ಡೈಎಲೆಕ್ಟ್ರಿಕ್ ಕಾನ್ಸ್ಟಾಂಟ್ ನ ಸ್ಲ್ಯಾಬ್‌ಗಳನ್ನು ಹೊಂದಿಸಿ ಮತ್ತು ಮತ್ತು ನಾವು ಅವುಗಳನ್ನು ಜೋಡಿಸಲು ಪ್ರಯತ್ನಿಸುತ್ತಿದ್ದೇವೆ ಆದ್ದರಿಂದ ಬೆಳಕು ಹರಿದು ಬರಲಿದೆ ಮತ್ತು ಅದು ಪ್ರತಿಬಿಂಬಿಸಲಿದೆ.

### English

The linear system response of course is fully known in terms of simple functions like exponents and sinusoids .We can use our powerful Eigen analysis tools to obtain Eigen values and Eigen vectors and write down the system response. There is no need to do integration. But, as I mentioned some time back that we use these two benchmark how our numerical integration, numerical methods work.

### Translated in Kannada - Sample 2

ಎಕ್ಸ್ ಪೊನೆಂಟ್ಸ್ (Exponents) ಮತ್ತು ಸೈನುಸಾಯ್ಡ್ (Sinusoids) ಗಳಂತಹ ಸರಳ ಕ್ರಿಯೆಗಳಲ್ಲಿ ರೇಖಾತ್ಮಕ ವ್ಯವಸ್ಥೆಯ ಪ್ರತಿಕ್ರಿಯೆಯು ಸಂಪೂರ್ಣವಾಗಿ ತಿಳಿದಿರುತ್ತದೆ. ಐಗನ್ ವ್ಯಾಲೂಸ್ (Eigen Values) ಮತ್ತು ಐಗನ್ ವೆಕ್ಟರ್ಸ್ (Eigen Vectors) ಗಳನ್ನು ಪಡೆದುಕೊಳ್ಳಲು ನಮ್ಮ ಪ್ರಬಲ ಐಗನ್ ವಿಶ್ಲೇಷಣಾ ಸಾಧನಗಳನ್ನು ನಾವು ಬಳಸಬಹುದು. ಅನುಕಲನ ಮಾಡಲು ಅಗತ್ಯವಿಲ್ಲ. ಆದರೆ, ನಾನು ಸ್ವಲ್ಪ ಸಮಯದ ಹಿಂದೆ ಹೇಳಿದಂತೆ ನ್ಯೂಮೆರಿಕಲ್ ಇಂಟಿಗ್ರೇಷನ್ (Numerical Integration), ನ್ಯೂಮೆರಿಕಲ್ ಮೆಥೋಡ್ಸ್ (Numerical Methods) ಹೇಗೆ ಕೆಲಸ ಮಾಡುತ್ತದೆಯೋ, ಈ ಎರಡು ಮಾನದಂಡಗಳನ್ನು ಬಳಸುತ್ತೇವೆ.

### Malayalam

### English

So could you please explain us about this Bragg's reflector.' and also the kind of virtual problem we are looking at taking the physical problem and modelling it on a virtual environment. So in the first example we are modelling a Bragg's reflector. This is nothing but a dielectric mirror. So dielectric mirror means it reflects incident energy; so whichever wave is incident in coming, part of it will be reflected and this is required for applications where in we need our beam to beam switching between some points. So basically what we are doing is we are staggering slabs of dielectric constants and kind of we are trying to stack them up so light is going to come and it is going to be reflected.

**Translated in Malayalam- Sample 1**

അതിനാൽ ബ്രാഗ് റിഫ്ലക്ടർനെ (Bragg reflector) പറ്റി വിശദീകരിക്കാമോ, അതുപോലെ ഒരു ശാരീരിക പ്രശ്നത്തിൽ നോക്കി കാണുമ്പോൾ ഉണ്ടാകുന്ന വെർച്വൽ പ്രശ്നത്തെക്കുറിച്ചും അത് ഒരു വിർച്വൽ അന്തരീക്ഷത്തിൽ മോഡലിംഗ് ചെയ്യുന്നതിനെ പറ്റിയും വിശദീകരിക്കാമോ. അതുകൊണ്ട് ആദ്യ ഉദാഹരണത്തിൽ നാം ഒരു ബ്രാഗ് റിഫ്ലക്ടർ (Bragg reflector) രൂപകൽപ്പന ചെയ്യുകയാണ്. ഇത് ഒരു ഡൈഇലക്ട്രിക് (dielectric ) മിറർ (mirror) അല്ലാതെ മറ്റൊന്നുമല്ല. അങ്ങനെ ഡൈഇലക്ട്രിക് (dielectric ) മിറർ (mirror) ഇൻസിഡന്റ് എനർജിയെ (incident energy) പ്രതിഫലിപ്പിക്കുന്നു. അതിനാൽ ഏത് തരം വേവ് (wave) ആണോ വരുന്നത്, ഇതിൽ ഒരു ഭാഗം പ്രതിഫലിപ്പിക്കപ്പെടും. ഇത് ചില പോയിന്റുകൾക്കിടയിൽ ഒരു ബീമിൽ നിന്ന് മറ്റൊരു ബീമിലേക്കു മാറുന്ന ആപ്ലിക്കേഷനിൽ (application) ആവശ്യകമാണ്. അടിസ്ഥാനപരമായി നമ്മൾ ചെയ്യുന്നത് വൈദ്യുതചതുര കോൺസ്റ്റൻറുകളിലെ സ്റ്റാബുകളെ അടുക്കുകയും, അതിനാൽ വെളിച്ചം വരികയും , അത് പ്രതിഫലിപ്പിക്കപ്പെടുകയും ചെയ്യുന്നു.

**English**

The linear system response of course is fully known in terms of simple functions like exponents and sinusoids .We can use our powerful Eigen analysis tools to obtain Eigen values and Eigen vectors and write down the system response. There is no need to do integration. But, as I mentioned some time back that we use these two benchmark how our numerical integration, numerical methods work.

**Translated in Malayalam- Sample 2**

എക്സ്പോണന്റ്സ് (exponents) സൈനോയീഡുകളു് (sinusoids) തുടങ്ങിയ ലളിതമായ ഫങ്ഷൻസിന്റെ (functions) അടിസ്ഥാനത്തിലാണ് ലീനിയർ സിസ്റ്റം (linear system) പ്രതികരണത്തെക്കുറിച്ച് അറിയപ്പെടുന്നത്. സിസ്റ്റത്തിന്റെ പ്രതികരണം ലഭിക്കുന്നതിനായി ഈഗൻ വാല്യൂ (eigen value) ഈഗൻ വെക്ടർ (eigen vector) എന്നിവ ലഭിക്കുന്നതിന് നമ്മുടെ ശക്തമായ ഈഗൻ വിശകലന ഉപകരണങ്ങൾ ഉപയോഗിക്കാം.കൂടാതെ സിസ്റ്റത്തിന്റെ പ്രതികരണം എഴുതുകയും ചെയ്യാം. ഇൻറഗ്രേഷൻ (integration) ചെയ്യേണ്ട ആവശ്യം ഇല്ല. പക്ഷേ, കുറച്ചുകാലം മുൻപ് ഞാൻ സൂചിപ്പിച്ചിരുന്നത് പോലെ, എങ്ങിനെയാണോ നമ്മുടെ ന്യൂമറിക്കൽ ഇൻറഗ്രേഷൻ (numerical integration), ന്യൂമറിക്കൽ മെത്തേഡ്സ് (numerical methods) പ്രവർത്തിക്കുന്നത് , അതുപോലെ തന്നെയാണ് ഈ രണ്ടു അളവ് കോലുകളും നമ്മൾ ഉപയോഗിക്കുന്നത് .

**Marathi**



## English

So could you please explain us about this Bragg's reflector.' and also the kind of virtual problem we are looking at taking the physical problem and modelling it on a virtual environment. So in the first example we are modelling a Bragg's reflector. This is nothing but a dielectric mirror. So dielectric mirror means it reflects incident energy; so whichever wave is incident in coming, part of it will be reflected and this is required for applications where in we need our beam to beam switching between some points. So basically what we are doing is we are staggering slabs of dielectric constants and kind of we are trying to stack them up so light is going to come and it is going to be reflected.

## Translated in Marathi - Sample 1

तर कृपया ब्रॅगच्या रिफ्लेक्टराबद्दल (Bragg's reflector) आणि वर्च्युअल समस्येबद्दल आपण आम्हाला समजावून सांगा. आम्ही शारीरिक समस्या घेऊन त्यास वर्च्युअल वातावरणात मॉडेलिंग करित आहोत. तर पहिल्या उदाहरणामध्ये आम्ही ब्रॅगच्या रिफ्लेक्टरला (Bragg's reflector) मॉडेल करत आहोत. हे एक डायइलेक्ट्रिक मिरर (Dielectric Mirror) आहे. हे डायइलेक्ट्रिक मिरर इंसिडेन्ट इनर्जीला (incident energy) प्रतिबिंबित करते; जेणेकरून येणारी वेव्ह (Wave) चा काहीभाग प्रतिबिंबित होईल आणि हे आवश्यक असते जेथे आपल्याला काही बिंदू दरम्यान बीममध्ये बदलण्याची गरज असते. तर आपण जे काही करत आहोत ते म्हणजे आपण डायइलेक्ट्रिक कॉन्स्टन्टच्या (Dielectric constant) स्लॅबला थरथरतवत आहोत आणि अशा प्रकारे आम्ही त्यांना जमा करण्याचा प्रयत्न करित आहोत यामुळे येणारे प्रकाश प्रतिबिंबित होते

## English

The linear system response of course is fully known in terms of simple functions like exponents and sinusoids .We can use our powerful Eigen analysis tools to obtain Eigen values and Eigen vectors and write down the system response. There is no need to do integration. But, as I mentioned some time back that we use these two benchmark how our numerical integration, numerical methods work.

## Translated in Marathi - Sample 2

रेखीय प्रणाली प्रतिसाद सर्वांना नक्कीच एक्सपोनंट्स (exponents) आणि सिनुसॉइड्स (sinusoids) सारख्या साध्या कार्यपद्धतीत प्रचलित आहे आपण आपले ऐजन विश्लेषण करण्यासाठीचे साधन वापरून, ऐजन वालुईस आणि ऐजन व्हेक्टर्स ह्यांच्या किमती मिळवून ,एखाद्या प्रणालीचा प्रतिसाद मोजू शकतो. इथे एकीकरण हि पद्धत वापरण्याची गरज नाही. पण ,पूर्वी नमूद केल्याप्रमाणे ,आपल्या नुमेरिकल इंटीग्रेशन (numerical integration) आणि नुमेरिकल मेथोडे (numerical methods) कसे काम करतात ,हे आपण दोन अस्तित्वात असलेल्या बेंचमार्क बरोबर तुलना करून पाहू शकतो

## Tamil

### English

So could you please explain us about this Bragg's reflector.' and also the kind of virtual problem we are looking at taking the physical problem and modelling it on a virtual environment. So in the first example we are modelling a Bragg's reflector. This is nothing but a dielectric mirror. So dielectric mirror means it reflects incident energy; so whichever wave is incident in coming, part of it will be reflected and this is required for applications where in we need our beam to beam switching between some points. So basically what we are doing is we are staggering slabs of dielectric constants and kind of we are trying to stack them up so light is going to come and it is going to be reflected.

### Translated in Tamil - Sample 1

எனவே, ப்ராக்க் ரிபிளெக்டர் (bragg reflector) பற்றியும் மெய்நிகர் பிரெச்சனைகளை பற்றியும் விளக்கவும். நாங்கள் பிஸிக்கல் ப்ரோப்ளேமை(Physical Problem) மாதிரியாக மெய்நிகர் சூழலில் பார்க்கவிருக்கிறோம். எனவே முதல் எடுத்துக்காட்டாக நாம் ஒரு ப்ராக்க் (Bragg) ரிபிளெக்டரை (reflector) மாடலிங் செய்கிறோம். இது ஒரு டைஎலக்ட்ரிக் மிரர் (dielectric mirror). எனவே டைஎலக்ட்ரிக் மிரர் (dielectric mirror) என்றால் இன்சிடென்ட் எனர்ஜியை (Incident energy) பிரதிபலிக்கூடிய கண்ணாடி; எனவே வருகின்ற அலையின் ஒரு பகுதி பிரதிபலிக்கப்படும், அது சில புள்ளிகளுக்கிடையே ஒரு பீமிலிருந்து (beam) மற்றோரு பீமிற்கு (beam) மாறும் பயன்பாடிற்கு தேவைப்படும். எனவே அடிப்படையில் நாம் டைஎலக்ட்ரிக் ஸ்லாப்சை (slabs) தடம்மாற்றி அமைக்கிறோம். சொல்லப்போனால் நாம் ஸ்லாப்சை (slabs) ஒன்றின்மேலொன்றாக அடுக்குகிறோம். இதனால் வருகின்ற ஒளியை அது பிரதிபலித்துவிடும்.

### English

The linear system response of course is fully known in terms of simple functions like exponents and sinusoids .We can use our powerful Eigen analysis tools to obtain Eigen values and Eigen vectors and write down the system response. There is no need to do integration. But, as I mentioned some time back that we use these two benchmark how our numerical integration, numerical methods work.

### Translated in Tamil - Sample 2

நேர்கோட்டு (linear) சிஸ்டம் பிரதிபலிப்பு என்பது எக்ஸ்பொனென்டீஸ் (exponents) மற்றும் சைனூசாய்டுகள் (sinusoids) போன்ற எளிய செயல்பாடுகளை அடிப்படையாகக் கொண்டு அறியப்படுகிறது. ஈகென் மதிப்புகள் (eigen values) மற்றும் ஈஜென் வெக்டரைப் (eigen vector) பெற நாம் நம் சக்திவாய்ந்த ஈஜென் பகுப்பாய்வு (eigen analysis) கருவிகளைப் பயன்படுத்தி கணினியில் பதில் எழுதி கொள்ளலாம். ஒருங்கிணைப்பு செய்ய வேண்டிய அவசியமில்லை. ஆனால், நான் முன் குறிப்பிட்டபடி நாம் இரண்டு பெஞ்சுமார்க்ஸ் (benchmarks) ஆகிய நியுமெரிக்கல் இன்டெக்ரிஜன் (numerical integration), நியுமெரிக்கல் செயல்பாடுகளை (numerical methods) உபயோகிக்கிறோம்.

### Telugu

### English

So could you please explain us about this Bragg's reflector.' and also the kind of virtual problem we are looking at taking the physical problem and modelling it on a virtual environment. So in the first example we are modelling a Bragg's reflector. This is nothing but a dielectric mirror. So dielectric mirror means it reflects incident energy; so whichever wave is incident in coming, part of it will be reflected and this is required for applications where in we need our beam to beam switching between some points. So basically what we are doing is we are staggering slabs of dielectric constants and kind of we are trying to stack them up so light is going to come and it is going to be reflected.

### Translated in Telugu - Sample 1

కాబట్టి మీరు బ్రాగ్గ్స్ రిఫ్లెక్టర్ (Bragg's reflector) గురించి వివరించగలరా మరియు ఒక ఫిజికల్ సమస్యని వర్చువల్ ఎన్విరాన్మెంట్లో మోడెలింగ్ (Modelling) చేయటం వలన మనము ఒక రకమైన వర్చువల్ సమస్యను చూస్తున్నాము. కాబట్టి మొదటి ఉదాహరణలో మనము Bragg's reflector ను మోడెలింగ్ చేస్తున్నాము. ఇది మరేదో కాదు ఇది ఒక డిఎలెక్ట్రిక్ మిర్రర్ (dielectric mirror). dielectric mirror ఇన్సిడెంట్ ఎనర్జీ (incident energy) ని రిఫ్లెక్ట్ (reflect) చేస్తుంది. అందువల్ల ఏవేవ్ (wave) అయితే పైన పడటం జరుగుతుంది, దానిలో కొంత భాగాన్ని ప్రతిబింబిస్తుంది మరియు ఇది మనకు అప్లికేషన్స్ కు (applications) అవసరం అవుతుంది. ఈ applications లో కొన్ని పాయింట్లు మధ్య ఒక బీమ్ కు మరొక బీమ్ కు స్విచింగ్ (switching) అవసరం. కాబట్టి మనం చేస్తున్న పని ఏమిటంటే, డైలెక్ట్రిక్ కాన్స్టెంట్స్ (dielectric constants) యొక్క అస్థిరమైన (staggering) slab లను పేర్చడానికి ప్రయత్నిస్తున్నాం, అందువల్ల కాంతి రావడం మరియు reflect కావడం జరుగుతోంది.

### English

The linear system response of course is fully known in terms of simple functions like exponents and sinusoids .We can use our powerful Eigen analysis tools to obtain Eigen values and Eigen vectors and write down the system response. There is no need to do integration. But, as I mentioned some time back that we use these two benchmark how our numerical integration, numerical methods work.

### Translated in Telugu - Sample 2

కోర్సు యొక్క Linear system response ఎక్స్పోనెంట్స్(exponents) మరియు సైనేసాయిడ్స్ (sinusoids )వంటి సాధారణ functions వలన పూర్తిగా తెలుస్తుంది .మనము శక్తివంతమైన Eigen analysis tools ఉపయోగించి Eigen values మరియు ఐజెన్ వెక్టర్స్ (Eigen vectors) పొందగలము మరియు system response ను వ్రాయవచ్చును ఇంటిగ్రేషన్ (Integration) చేయవలసిన అవసరం లేదు. కానీ నేను ఇంతకు ముందు చెప్పిన విధముగా ఈ రెండు బెంచ్ మార్కును న్యూమెరికల్ ఇంటిగ్రేషన్ (numerical integration) , న్యూమెరికల్ మెథడ్స్ (numerical methods) లో ఉపయోగిస్తాము .

### Annexure 5 - Sample for Glossary

### Hindi

English Word	Word	Meaning
Marketing insights	मार्केटिंग इनसाइट्स	विपणन अंतर्दृष्टि
Scaling	स्केलिंग	स्केलिंग
Brand equity	ब्रांड इक्विटी	ब्रांड इक्विटी

Multivariate techniques	मुलतीवरीयते टेक्निक्स	बहुभिन्नरूपी तकनीक
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### Bengali

English Word	Word	Meaning
Spectrum	স্পেকট্রাম	বর্ণালী
Electronics	ইলেক্ট্রনিক্স	বৈদ্যুতিন
Power	পাওয়ার	ক্ষমতা
Electron	ইলেক্ট্রন	বৈদ্যুতিক পরমাণু

### Gujarati

English Word	Word	Meaning
Spectrum	સ્પેક્ટ્રમ	સ્પેક્ટ્રમ
Electronics	ઇલેક્ટ્રોનિક્સ	વીજાણુવિજ્ઞાન
Power	પાવર	શક્તિ
Electron	ઇલેક્ટ્રોન	ઇલેક્ટ્રોન

### Kannada

English Word	Word	Meaning
Spectrum	ಸ್ಪೆಕ್ಟ್ರಮ್	ವರ್ಣಪಟಲ
Electronics	ಎಲೆಕ್ಟ್ರಾನಿಕ್ಸ್	ವಿದ್ಯುಜ್ಜನಿತ
Power	ಪವರ್	ವಿದ್ಯುತ್
Electron	ಎಲೆಕ್ಟ್ರಾನ್	ವಿದ್ಯುತ್ ಪರಮಾಣು

### Malayalam

English Word	Word	Meaning
Spectrum	സ്പെക്ട്രം	വർണ്ണരാജി
Electronics	ഇലക്ട്രോണിക്സ്	ഇലക്ട്രോണിക്സ്
Power	പവർ	ശക്തി
Electron	ഇലക്ട്രോൺ	സൂക്ഷ്മകണം

## Marathi

English Word	Word	Meaning
Spectrum	स्पेक्ट्रम	वर्णपट
Electronics	इलेक्ट्रॉनिक्स	वीजकशास्त्र
Power	पावर	शक्ती
Electron	इलेक्ट्रॉन	इलेक्ट्रिक अणू

## Tamil

English Word	Word	Meaning
Electronics	எலக்ட்ரோனிக்ஸ்	மின்னணுவியல்
Spectrum	ஸ்பெக்ட்ரம்	அலைக்கற்றை
Power	பவா	மின்சக்தி
Electron	எலக்ட்ரான்	மின் அணு

## Telugu

English Word	Word	Meaning
Spectrum	స్పెక్ట్రమ్	వర్ణపటం
Electronics	ఎలక్ట్రానిక్స్	విద్యుత్కణశాస్త్రం
Power	పవర్	శక్తి
Electron	ఎలక్ట్రాన్	విద్యుత్కణం

**Annexure 6 - Index page sample**

**Hindi**

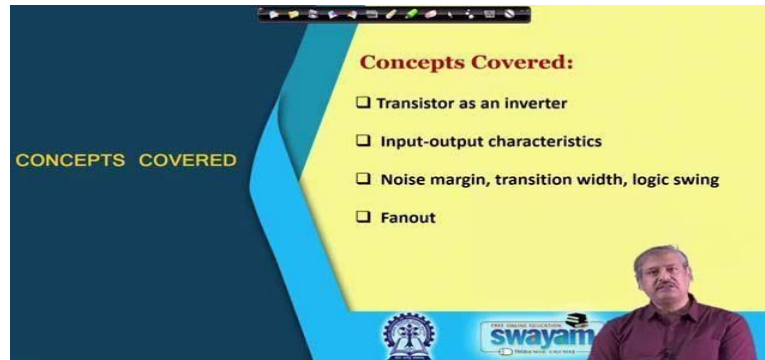
Sl. No	Topic	Page No
	<b>Week 1</b>	
1	मैटलैब प्रोग्रामिंग की भूमिका	
2	मैटलैब प्रोग्रामिंग (MATLAB Programming)का परिचय	
	<b>Week 2</b>	
3	अर्रस एंड मेट्रिक्स ऑपरेशन्स	
4	लूप्स एंड एक्सेक्यूटिव कंट्रोल	
5	संचालन पुनरीक्षित	
6	फाइल स्क्रिप्ट (file script) और फंक्शंस (functions) के साथ काम करना	
7	प्लॉटिंग और आउटपुट	
	<b>Week 3</b>	
8	असाइनमेंट सबमिशन (assignment submission) के लिए सहायक वीडियो।	
9	MATLAB ऑनलाइन (online) तक पहुंचने के लिए वीडियो (video) की सहायता करें	
	<b>Week 4</b>	
10	न्यूमेरिकल मेथड्स (numerical methods) में एरर्स (errors )	
11	ट्रंकेशन एंड राउंड ऑफ एरर्स	
12	इट्रटीव मेथड्स	
13	स्टेपवाइज (stepwise) तरीके और एरर प्रोपगेशन	
	<b>Week 5</b>	
14	एक वेरिएबल (variable) में डिफ्रेंटिएशन	

## Annexure 7 - Sample for Monolingual DOC

Digital Electronic Circuits  
Prof. Goutam Saha  
Department of E & EC Engineering  
Indian Institute of Technology, Kharagpur

### Lecture – 02 Transistor as a Switch

नमस्कार मित्रों अब हम इस विषय के दूसरे व्याख्यान या लेक्चर की तरफ बढ़ते हैं। पहले लेक्चर यानी इससे पहले के व्याख्यान में हमने जाना की क्यों डिजिटल टेक्नोलॉजी (digital technology) महत्वपूर्ण है, डिजिटल टेक्नोलॉजी का गठन किस प्रकार किया गया है, स्विचिंग (switching) की क्या महत्ता यानी इंपोर्टेंस है, स्विचिंग लॉजिक रिलेशन (logic relation) से कैसे जुड़ी हुई है और डायोड (diode) का प्रयोग स्विचिंग (switching) के लिए कैसे किया जाता है। तो यह हमने पहले जाना। और उस चर्चा में हमने देखा कि डायोड को एंड व और लॉजिक (AND and OR logic) के प्रयोग के लिए स्विच की तरह प्रयोग किया जा सकता है। अब हमारे पास यह प्रश्न आता है की क्या हम डायोड को इनवर्टर लॉजिक या नॉट लॉजिक (inverter logic or NOT logic) के लिए प्रयोग कर सकते हैं। इसका उत्तर हमें अपनी समझ से मिल जाता है कि यह संभव नहीं है लेकिन ट्रांजिस्टर (transistors) नोट लॉजिक या इनवर्टर (NOT logic or inverter) के लिए प्रयोग किए जा सकते हैं।



तो आज के व्याख्यान में हम ट्रांजिस्टर का स्विच (Transistor as a switch) की तरह उपयोग जानेंगे। और हम उसके इनपुट व आउटपुट (input output) की विशेषताएं और कुछ दूसरे जरूरी मापदंड जैसे ध्वनि की मार्जिन, ट्रांजिशन की चौड़ाई, लॉजिक स्विंग और फैन आउट (noise margin, transition width, logic swing and fanout) को भी देखेंगे।

## Transistor as a switch

Realization of NOT gate (inverter), Input-Output Characteristics

**For quantitative analysis:**

- $R_B = 10 \text{ k}\Omega$
- $R_C = 1 \text{ k}\Omega$
- $\beta_F = 50$
- $V_{BE(ON)} = V_{BE(Sat)} = 0.7V$
- $V_{CE(Sat)} = 0.2V$

तो हम ट्रांजिस्टर पर आधारित इन्वर्टर (transistor based inverters) के सबसे सरल सर्किट (circuit) के एक बुनियादी सर्किट (circuit) से शुरुआत करते हैं। तो जो हम ऊपर की स्लाइड (slide) के बाएं हाथ के हिस्से में देख रहे हैं वह एक सर्किट (circuit) है जहां हम देख सकते हैं की यह एक एनपीएन ट्रांजिस्टर बाइपोलर जंक्शन ट्रांसिस्टर (NPN transistor bipolar junction transistor) है, यह उसका बेस (base) है, यह इसका कलेक्टर (collector) है और यह इसका एमीटर (emitter) है, ठीक है।

यह कलेक्टर आरसी (RC) के द्वारा मुख्य बिजली आपूर्ति से जुड़ा हुआ है, वीसीसी (Vcc) जोकि एक सकारात्मक यानी पॉजिटिव पावर सप्लाई (positive power supply) है, उसके लिए हम 5 वोल्ट मान लेते हैं। और बेस एक रेजिस्टेंस (resistance) आरबी (RB) के द्वारा एक इनपुट वोल्टेज वी इन (Vin) के साथ जुड़ा है। यहां आरबी (RB) रेजिस्टेंस है और आरसी (RC) कलेक्टर रेजिस्टेंस (collector resistance) है।

और इसका उत्पादन या आउटपुट (output) कलेक्टर सी (collector C) से लिया जाता है, ठीक है। तो यह एक बुनियादी विन्यास या बेसिक कॉन्फिगरेशन (basic configuration) है जिसे हम देखेंगे। तो अगर आप इस सर्किट को देखें और यदि हम एक ग्राफ (plot) बनाने की कोशिश करते हैं, वी इन और वी आउट के बीच में (Vin versus Vout), तो इस तरफ यह एक्स एक्सेस (x axis) में वीएन (Vin) है, जोकि एक स्वतंत्र संख्या यानी इंडिपेंडेंट वेरिएबल (independent variable) है जबकि वाई एक्सेस (y axis) में वी आउट (Vout) है जोकि एक डिपेंडेंट वेरिएबल (dependent variable) या इकाई है। तो इस प्रकार यह सर्किट एकदम शुरु में काम करेगा जब वीएन (Vin) शून्य है, ठीक है।

अभी ट्रांजिस्टर बंद अवस्था में है यानी ऑफ (off state) है। तो इस समय क्या आउटपुट (output) रहेगा? इस ट्रांजिस्टर (transistor) को देखें - यह अभी बंद है, इसमें कोई करंट नहीं है, कोई आईसी (Ic) करंट नहीं बह रहा है, ना कोई कलेक्टर करंट बह रहा है।

तो कलेक्टर करंट (collector current) हो गया आई सी (IC) \* आरसी (ICRC)। अब इस संख्या को यदि वीसीसी (VCC minus ICRC) से घटा देंगे तो वह हो जाएगा हमारा वीआउट (Vout) ठीक है।

$$V_{out} = V_{CC} - I_C R_C$$



**Digital Electronic Circuits**  
**Prof. Goutam Saha**  
**Department of E & EC Engineering**  
**Indian Institute of Technology, Kharagpur**

**Lecture – 02**  
**Transistor as a Switch**

Hello everybody, we move to lecture 2 of this particular course.

नमस्कार मित्रों अब हम इस विषय के दूसरे व्याख्यान या लेक्चर की तरफ बढ़ते हैं।

In lecture 1, that is in the previous lecture, we had seen why digital technology is important, what constitutes digital technology, the importance of switching, association of switching with logic relation and use of diode as a switch. So, this is what we had seen earlier.

पहले लेक्चर यानी इससे पहले के व्याख्यान में हमने जाना की क्यों डिजिटल टेक्नोलॉजी (digital technology) महत्वपूर्ण है, डिजिटल टेक्नोलॉजी का गठन किस प्रकार किया गया है, स्विचिंग (switching) की क्या महत्ता यानी इंपोर्टेंस है, स्विचिंग लॉजिक रिलेशन (logic relation) से कैसे जुड़ी हुई है और डायोड (diode) का प्रयोग स्विचिंग (switching) के लिए कैसे किया जाता है। तो यह हमने पहले जाना।


And in that discussion we had seen that diode as a switch can be used for developing AND and OR logic - ok. We left ourselves with a question that whether you can get an inverter logic or NOT logic using diode which we found that from our common understanding it is not possible, but transistors can be used for generating NOT logic or inverter - ok.

और उस चर्चा में हमने देखा कि डायोड को एंड व और लॉजिक (AND and OR logic) के प्रयोग के लिए स्विच की तरह प्रयोग किया जा सकता है। अब हमारे पास यह प्रश्न आता है की क्या हम डायोड को इनवर्टर लॉजिक या नॉट लॉजिक (inverter logic or NOT logic) के लिए प्रयोग कर सकते हैं। इसका उत्तर हमें अपनी समझ से मिल जाता है कि यह संभव नहीं है लेकिन ट्रांजिस्टर (transistors) नोट लॉजिक या इनवर्टर (NOT logic or inverter) के लिए प्रयोग किए जा सकते हैं।

**CONCEPTS COVERED**

**Concepts Covered:**

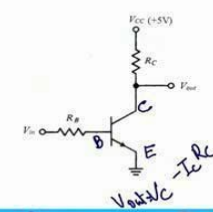
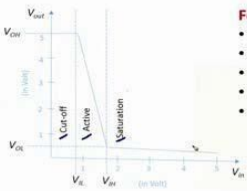
- Transistor as an inverter
- Input-output characteristics
- Noise margin, transition width, logic swing
- Fanout



So, in today's lecture we shall cover Transistor as a switch. So, we shall look at its input output characteristics and some important parameters like noise margin, transition width, logic swing and fanout.


तो आज के व्याख्यान में हम ट्रांजिस्टर का स्विच (Transistor as a switch) की तरह उपयोग जानेंगे। और हम उसके इनपुट व आउटपुट (input output) की विशेषताएं और कुछ दूसरे जरूरी मापदंड जैसे ध्वनि की मार्जिन, ट्रांजिशन की चौड़ाई, लॉजिक स्विंग और फैन आउट (noise margin, transition width, logic swing and fanout ) को भी देखेंगे।

**Transistor as a switch**  
**Realization of NOT gate (inverter), Input-Output Characteristics**

**For quantitative analysis:**

- $R_B = 10 \text{ k}\Omega$
- $R_C = 1 \text{ k}\Omega$
- $\beta_F = 50$
- $V_{BE(ON)} = V_{BE(sat)} = 0.7V$
- $V_{CE(sat)} = 0.2V$



So, we start with a basic circuit of a very simple circuit of transistor based inverters. So, what we see in the left hand side of the slide is a circuit where we see this is an NPN transistor bipolar junction transistor, this is the base, this is the collector and this is the emitter - ok.

तो हम ट्रांजिस्टर पर आधारित इनवर्टर (transistor based inverters) के सबसे सरल सर्किट (circuit) के एक बुनियादी सर्किट (circuit) से शुरुआत करते हैं। तो जो हम ऊपर की स्लाइड (slide) के बाएं हाथ के हिस्से में देख रहे हैं वह एक सर्किट (circuit) है जहां हम देख सकते हैं की यह एक एनपीएन ट्रांजिस्टर बाइपोलर जंक्शन ट्रांसिस्टर (NPN transistor bipolar junction transistor) है, यह उसका बेस (base) है, यह इसका कलेक्टर (collector) है और यह इसका एमीटर (emitter) है, ठीक है।

So, this collector is connected through this  $R_C$  to power supply, the  $V_{CC}$  a positive power supply, we considered 5 volt here. And, the base is connected to an input voltage  $V_{in}$  through a resistance which is  $R_B$ , this resistance  $R_B$ ; this is collector resistance  $R_C$  - ok.

यह कलेक्टर आरसी ( $R_C$ ) के द्वारा मुख्य बिजली आपूर्ति से जुड़ा हुआ है, वीसीसी ( $V_{CC}$ ) जोकि एक सकारात्मक यानी पॉजिटिव पावर सप्लाई (positive power supply) है, उसके लिए हम 5 वोल्ट मान लेते हैं। और बेस एक रेजिस्टेंस (resistance) आरबी ( $R_B$ ) के द्वारा एक इनपुट वोल्टेज वी इन ( $V_{in}$ ) के साथ जुड़ा है। यहां आरबी ( $R_B$ ) रेजिस्टेंस है और आरसी ( $R_C$ ) कलेक्टर रेजिस्टेंस (collector resistance) है।

And output is taken from collector C - right. So, this is the basic configuration which we shall examine. Now if you look at this circuit and we try to plot  $V_{in}$  versus  $V_{out}$ ,  $V_{in}$  versus  $V_{out}$  - ok. So, this side this x axis is  $V_{in}$ , independent variable along the x axis; y axis is the dependent variable  $V_{out}$ . So, how this circuit will work right in the beginning when  $V_{in}$  is 0 ok.

और इसका उत्पादन या आउटपुट (output) कलेक्टर सी (collector C) से लिया जाता है, ठीक है। तो यह एक बुनियादी विन्यास या बेसिक कॉन्फिगरेशन (basic configuration) है जिसे हम देखेंगे। तो

अगर आप इस सर्किट को देखें और यदि हम एक ग्राफ (plot) बनाने की कोशिश करते हैं, वी इन और वी आउट के बीच में ( $V_{in}$  versus  $V_{out}$ ), तो इस तरफ यह एक्स एक्सेस (x axis) में वीएन ( $V_{in}$ ) है, जोकि एक स्वतंत्र संख्या यानी इंडिपेंडेंट वेरिएबल (independent variable) है जबकि वाई एक्सेस (y axis) में वी आउट ( $V_{out}$ ) है जोकि एक डिपेंडेंट वेरिएबल (dependent variable) या इकाई है। तो इस प्रकार यह सर्किट एकदम शुरू में काम करेगा जब वीएन ( $V_{in}$ ) शून्य है, ठीक है।

So, the transistor is in off state. So, at that time what will be the output? See this transistor - this transistor is off, no current is, no  $I_c$  current is flowing, no collector current is flowing.

अभी ट्रांजिस्टर बंद अवस्था में है यानी ऑफ (off state) है। तो इस समय क्या आउटपुट (output) रहेगा? इस ट्रांजिस्टर (transistor) को देखें - यह अभी बंद है, इसमें कोई करंट नहीं है, कोई आईसी ( $I_c$ ) करंट नहीं बह रहा है, ना कोई कलेक्टर करंट बह रहा है।

So, collector current: that  $I_c$  into  $R_c$  this drop  $V_{cc}$  minus  $I_c R_c$  that is your  $V_{out}$ , this is your  $V_{out}$  - ok.

तो कलेक्टर करंट (collector current) हो गया आई सी ( $I_c$ ) \* आरसी ( $I_c R_c$ )। अब इस संख्या को यदि वीसीसी ( $V_{cc}$  minus  $I_c R_c$ ) से घटा देंगे तो वह हो जाएगा हमारा वीआउट ( $V_{out}$ ) ठीक है।

$$V_{out} = V_{cc} - I_c R_c$$

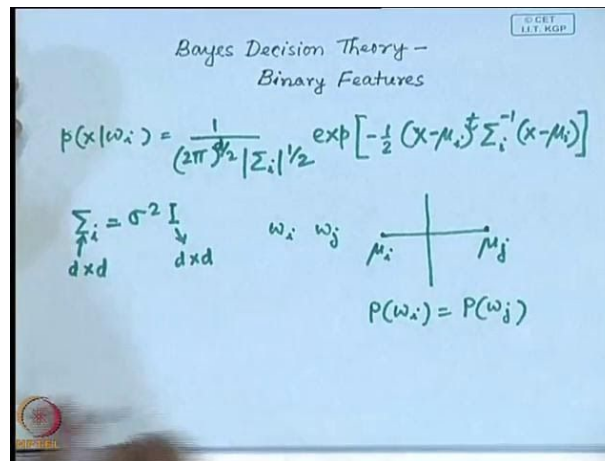
Annexure 9 - Sample Transcript in English for Translation

Vendor to translate this in all languages for which you are bidding in the 4 formats mentioned in Section 2 (Monolingual Doc, Bilingual DOC, Monolingual PDF, Monolingual MP3 as a password protected zipped file). MP3 files to be sent along with the Technical bid.

**Pattern Recognition and Applications**  
**Prof. P. K. Biswas**  
**Department of Electronics and Electrical Communication Engineering**  
**Indian Institute of Technology, Kharagpur**

**Lecture - 9**  
**Bayes Decision Theory – Binary Features**

(Refer Slide Time: 00:41)



Good morning, so we are going to discuss today the Bayes decision theory for binary features. So far what we have discussed is assuming that the feature vectors are distributed following

some normal distribution of the form 
$$P(\mathbf{x}/\omega_i) = \frac{1}{(2\pi)^{d/2} |\Sigma|^{1/2}} \exp \left[ -\frac{1}{2} \left\{ (\mathbf{x} - \mu_i)' \Sigma_i^{-1} (\mathbf{x} - \mu_i) \right\} \right]$$
. So,

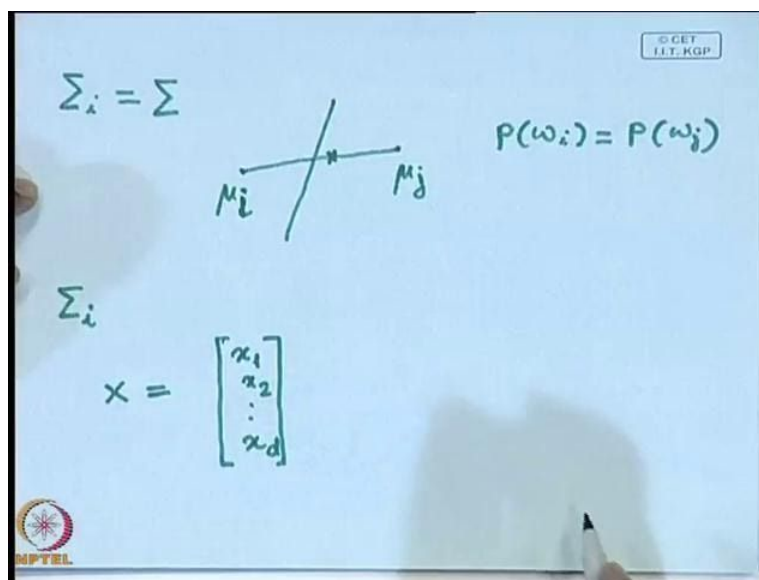
this is the expression for a multivariate normal distribution. And we have seen that, in this expression where  $\Sigma_i$  represents the covariance matrix, that for different conditions of covariance matrices, we can have different types of classifier.

Say the first case we have discussed is, if the covariance matrix for every class  $i$  is of the form,  $\sigma^2 I$ , where both this covariance matrix is of dimension  $d \times d$ . Where our feature vectors are of dimension  $d$  and this identity matrix is also of dimension  $d \times d$ . So, because this is identity matrix so this simply says that covariance matrix is a diagonal matrix, where every diagonal element is of value  $\sigma^2$ . That means every component have the same variance whereas off diagonal elements are equal to 0 so because off diagonal elements are 0's so the components, different components of the feature vectors are statistically independent.

So, in such cases we have seen that, the classifier is nothing but a linear classifier or when we talked about the discriminant function, the discriminant function for, function for individual classes, they are also linear functions. And because they are linear functions so the classifier which employs this linear functions to classify and an unknown feature vector, that is a linear machine. And in particular, if we want to find out the decision boundary two different classes say  $i^{\text{th}}$  class,  $\omega_i$  and the  $j^{\text{th}}$  class,  $\omega_j$  the decision boundary between these two different classes is a hyper plane, which is orthogonal to the line joining  $\mu_i$  and  $\mu_j$ , where  $\mu_i$  and  $\mu_j$  are the centers of the classes  $\omega_i$  and  $\omega_j$ .

So, effectively I have a situation something like this, that, if I have  $\mu_i$  somewhere over here, which is the mean of the class  $\omega_i$  and  $\mu_j$  is somewhere over here. Then the decision surface is orthogonal, is a hyper plane, which is orthogonal to the line joining  $\mu_i$  and  $\mu_j$ . And if the apriori probabilities  $P(\omega_i) = P(\omega_j)$  then this decision boundary or the decision surface becomes an orthogonal bisector of the line joining  $\mu_i$  and  $\mu_j$ . So, this was our simplest case.

(Refer Slide Time: 04:20)



**Annexure 10 - Details regarding works of similar nature executed in the last 3 years**

Sl.No.	Name of work with link	Client Name & Address	Cost of work (in crores)	Start Date	End Date	Details of officer to whom references can be made	Remarks

Documents to be attached along with the above statement:

- a) Purchase orders
- b) Any other relevant documents

**(Signature of bidder with company stamp)**

**Annexure 11 - Financial Information**

Details furnished below are to be supported duly by figures in Balance Sheet, Profit & Loss Account for the last 5 years as certified by the Chartered Accountant and submitted by the bidder to the Income Tax Department.

Details	2015-16	2016-17	2017-18	2018-19	2019-20
1. Gross Annual Turnover for works of similar nature					
2. Profit/Loss					
3. Financial Position a. Cash b. Current Assets c. Current Liabilities d. Working Capital e. Current Asset to Liability Ratio					

Documents to be attached along with the above statement:

- a) Up-to-date Income Tax Clearance Certificate
- b) Certificate of Financial soundness from the bankers of the Bidders
- c) Financial Arrangements for carrying out the proposed work
- d) Any other relevant documents

**(Signature of bidder with company stamp)**



## Annexure 12 - Structure of the Organization

1. Name and address of bidder:
2. Telephone No./Fax No./Email address :
3. Legal status (Attach copies of original document defining the legal status).
  - a) An Individual/ Consortium:
  - b) A Proprietary/ Partnership agency:
  - c) A Trust:
  - d) A Limited Company or Corporation:
4. Particulars of Registration with various Government bodies & Statutory Tax Authorities (attach attested photocopy)
  - a. Registration Number:
  - b. Organization/Place of registration:
  - c. Date of validity:
5. Names and titles of Directors & Officers with designation to be concerned with this work with designation of individuals authorized to act for the organization.
6. Were you or your company ever required to suspend the work for a period of more than six months continuously after you commenced the works? If so, give the name of the project and reasons for not completing the work.
7. Have you or your constituent partner(s) ever left the work awarded to you incomplete? If so, give name of the project and reasons for not completing the work.
8. Have you or your constituent partner(s) been debarred/black listed for tendering in any organization at any time? If so, give details.
9. Area of Specialization and Interest
10. Location and address of all branches of the organization
11. Any other information considered necessary but not included above.

**(Signature of bidder with company stamp)**

## Annexure 13 - Profile of team

### Profile of Project Lead

- Educational Qualification
- Work Experience

### Profile of reviewer

- Educational Qualification
- Work Experience

### Part-time team

- No. of team members
- Their basic educational qualification
- Work Experience

### Out-sourced team

- No. of team members
- Their basic educational qualification
- Work Experience

**(Signature of bidder with company stamp)**