Ethics in Engineering Practice
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Lecture – 19
Engineers, Nuclear Testing and Weapons

Welcome to today's session. Today we will be discussing on Engineering, Nuclear Testing and Weapons. In the last discussion, we have discussed about the role of weapons and how like the computer technology has made this, become more important with related to weapons, when it talks of like firing them automatically, then who takes the onus on in case of wrong firing and other related responsibilities with respect to it. In today's session we are going to give a greater coverage on nuclear testing weapons and, the role of engineers with in relation to that.

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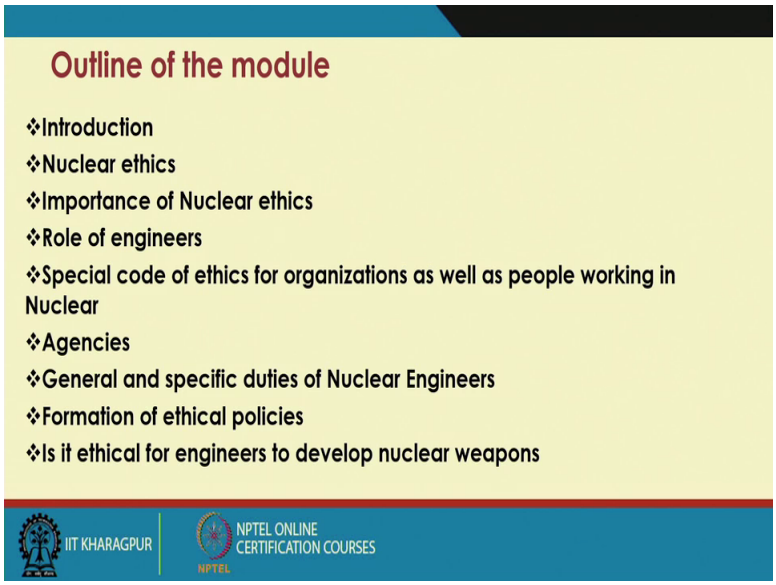

So, today's module is going to cover a nuclear ethics, importance of nuclear ethics, role of engineers in it. Special code of ethics for organizations as well as people working in nuclear agencies, general and specific duties of nuclear engineers, formation of ethical policies, is it ethical for engineers to develop nuclear weapons.

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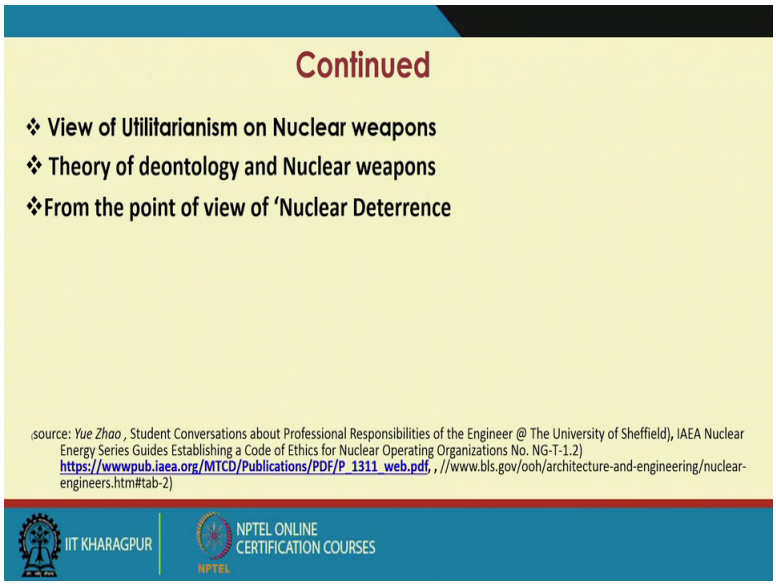

Again we will try to see it from a various ethical perspective like view of utilitarianism on nuclear weapons, theory of deontology and nuclear weapons from the view of nuclear deterrence.

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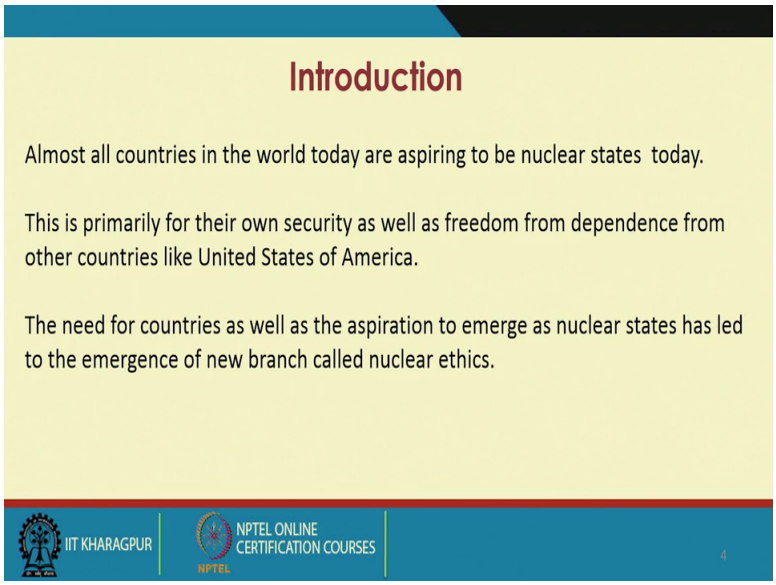

And so, we will discuss each one separately with emphasis on the role of engineers in it and the ethical issues with respect to it. So, like we understand today like all the countries of the world are aspiring to be nuclear states today.

This is for the sake of their own freedom, as well as security and freedom from like the this is for their security as well as freedom from dependence from other countries like USA mean. So, the need for the country and, their aspiration to emerge as nuclear states has led to a newer branch of ethics, which we call as nuclear ethics. Again before we start discussing in details on this issue, we must try to understand this is again of like, we discussed about computer technology and the related responsibilities understanding one's own duties, towards the others because it gives so, much of power so, that power can be used in a positive sense, or it can be used in a negative sense also.

So, it depends lot on the values and virtues of the people, there may be the culture of the nation the values of the nation and lot of self discipline and self competence, to see like how we are using this immense power, that the nuclear weapons may be giving to us. So, um in this context we will see the whole discussion and maybe try to analyze it.

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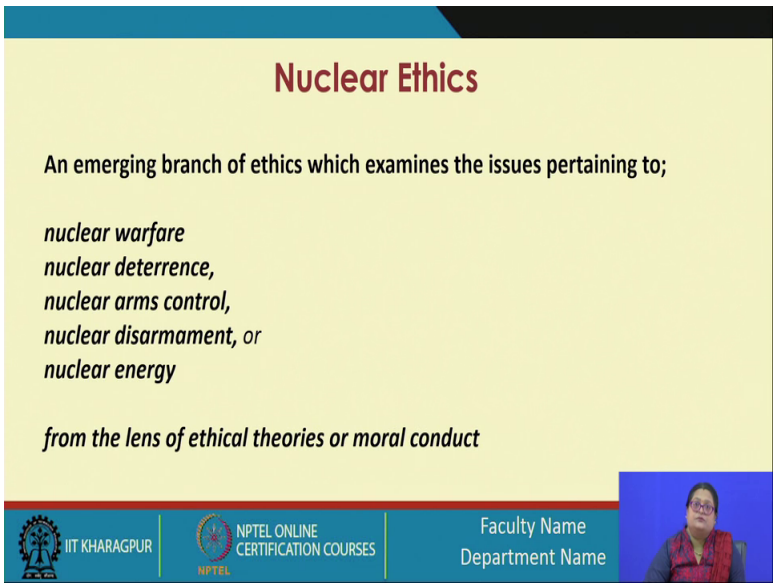

So, nuclear ethics is an emerging branch of ethics which talks of nuclear welfare, nuclear deterrence, nuclear arms control, nuclear disarmament, or nuclear energy from the net lengths of ethical theories or moral conduct, we will see each of these terminologies separately and try to understand what they mean.

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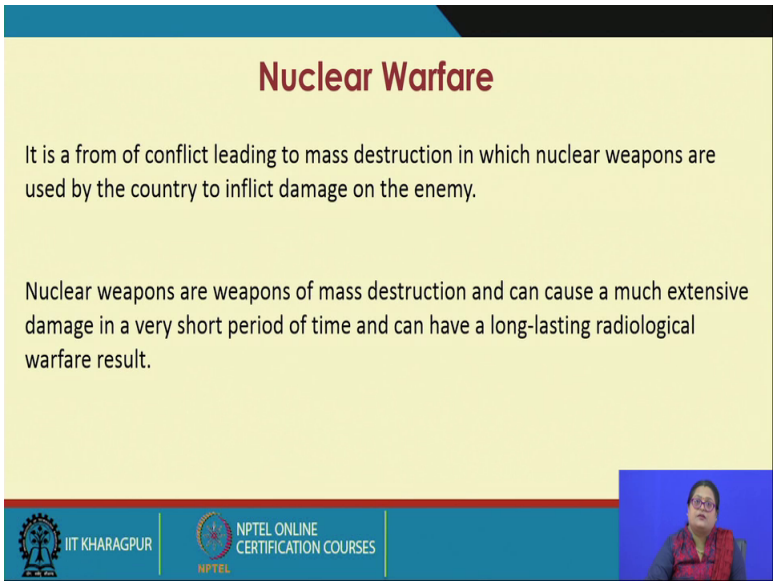

Nuclear warfare it is a type of conflict form of conflict, which is leading to mass destruction in which nuclear weapons are used by the country to inflict damage on the enemy. So, nuclear weapon why it is used, as nuclear weapons is a weapons of mass destruction can cause much extensive damage in a very short period of time, and could have a long lasting effect as a warfare result. So, destructions caused within a short time, but having a long lasting radiological effect. So, that is why it is a like very it is a strong as a weapon and this weapon of mass destruction.

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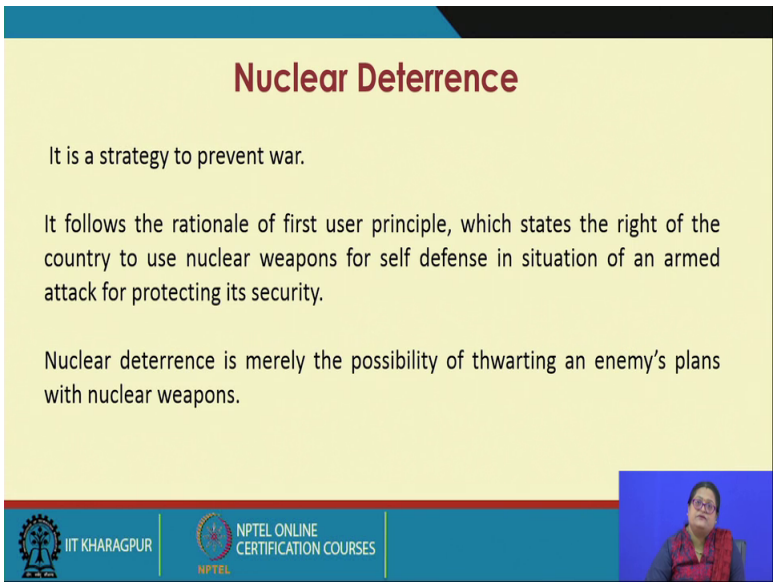

So, it is a strategy to use to prevent war. So, that is called nuclear deterrence. So, when we talk of nuclear deterrence it is a strategy to prevent work it follows the rationale of the first user principle which states that the right of the country to use nuclear weapons for a self defense in situation of an armed attack for protecting its security. So, it is like when you are talking of nuclear deterrence it is the possibility of thwarting an enemy's plans with nuclear weapons. So, it is a strategy to prevent war.

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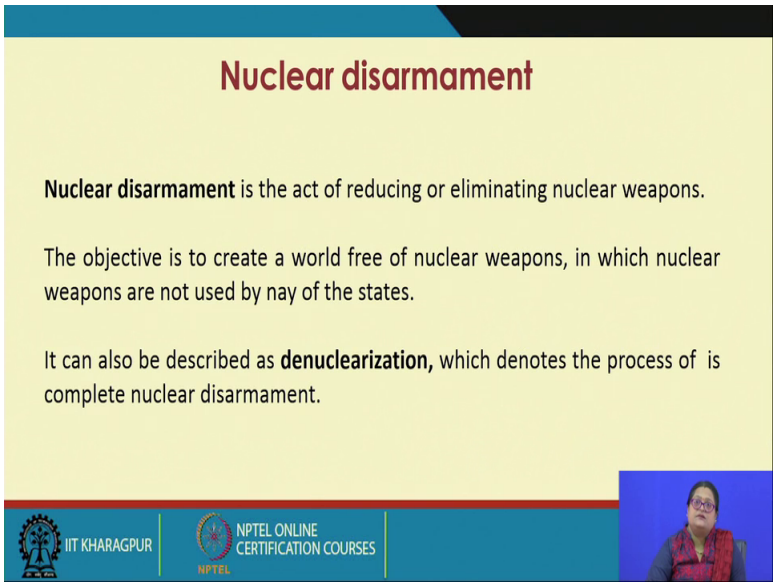

Nuclear disarmament is a act of reducing, or eliminating nuclear weapons. It is an objective to create a world, which is free of nuclear weapons in which nuclear weapons are not used by any of the states. So, it can also be described as denuclearization, which denotes that the process is of complete nuclear disarmament.

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But what we mean try to see like it requires like, what we may try to see over here, that it requires may be both the countries who are like deciding for this nuclear disarmament to be equally powerful and agreeing to that. And is otherwise one may decide for a nuclear disarmament where, but the other if it does not decide for it. So, it may lead to an inequality of power. So, when nuclear disarmament is decided it needs to be in the form of like consensus by the countries who decide for it, arms control refers to treaties made between potential adversaries that reduce the likelihood and scope of war, usually imposing limitation on military capabilities.

So, all the disarmaments always involves the reduction of military forces, or weapons arms control does not. So, it is again a treaty which is made between potential adversaries, can you talking of a disarmament it is like complete disarmament we are not going to use any nuclear weapons, but when you are trying to talk of control it is of limited use, it is not total not use, but is a limited use.

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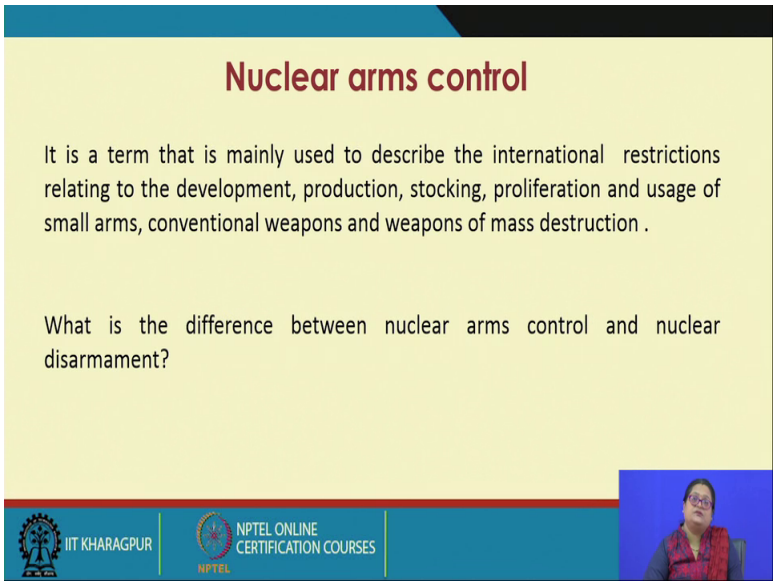

But for that also some agreement is required between the potential adversaries. When we talk of nuclear arm control it is a term that is used to describe the international restrictions relating to the development, production, stocking proliferation and usage of small arms, conventional weapons and weapons of mass destruction. So, then what is the difference between nuclear arms control and nuclear disarmament.

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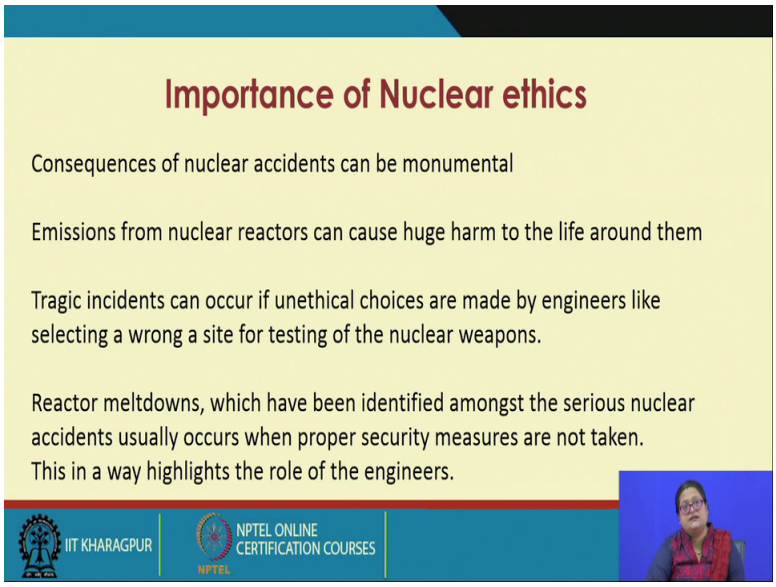

The difference is like when you are talking of a disarmament, it is totally like banning and it is like you are not going to use it in any form again. But when you are talking of

like nuclear arms control, it talks to the international restrictions on the development production stocking proliferation and usage. So, it has like it relates to all the four five stages and, it relate to small arms conventional weapons and weapons of mass destruction, when we talk of disarmament it is complete like, we go for like this there will be no nuclear weapon.

So, based on that we are going to discuss about the importance of nuclear ethics, why it is important for having a nuclear ethics is consequences of nuclear accidents can be monumental, emissions from nuclear reactors can cause huge harm to the life around them. Tragic incidents can occur if unethical choices are made by engineers, like selecting a wrong site for testing of the nuclear weapons. Reactor meltdowns which have been identified amongst the serious nuclear accidents, usually occurs when proper security measures are not taken. This is where again it highlights the role of the engineers, because if you remember the in the primary focus of the role of engineers is the safety and security and the health and property of the like the country at of the people of the country at large.

So, when we talks of accidents and the great consequence is related to it and, the harm provided to the life around through emissions from nuclear reactors, then taking a like unethical choice of doing the testing in a wrong site. The reactor meltdowns these have been leading to serious accidents, which have been claiming lives and not only of a single generation maybe across generations also.

So, it becomes more important about the role of the engineers in like being careful, in this while handling these things, or designing for these things, or testing for these things. So, that the safety and security of the people at large are not compromised.

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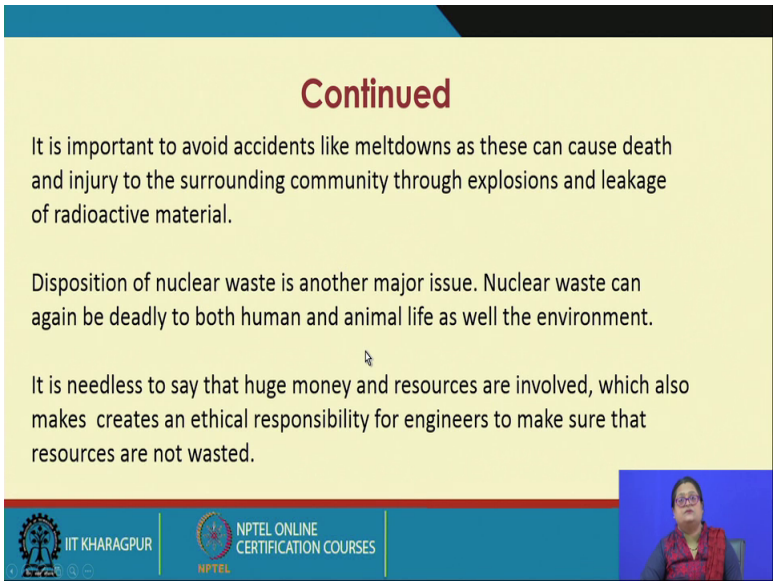

So, like it is why it is important to avoid accidents like meltdowns, as these can cause death and injury to the surrounding community, through explosions and leakage of radioactive material. Disposition of nuclear waste is another major issue, nuclear waste can again be deadly to both human and animal life as well as the environment.

So, how you are disposing it off like, because the waste can be hazardous to both animal and human and as well as the environment. So, we can understand because it involves huge money and resources so, if resources are involved. So, it becomes an ethical responsibility of the engineers also to make sure that the resources are not wasted.

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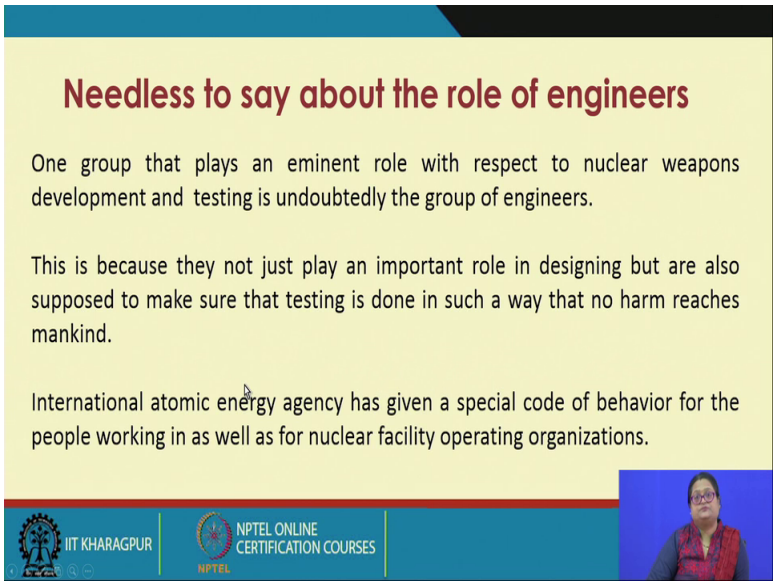

So, because of these things because we understand like that the primarily the focus, is on the safety and security issues it takes into consideration. The safety and health issues of not only the animals not only the humans, but also its effect or negative consequences on the environment at large.

So, there becomes the role of the engineer is more important because, they are the people who are thinking about it who are designing about it, who are testing and also who are implementing it to see this implication. So, the role of engineers becomes very important in this. So, let us see how the role of engineers are important so, they were important, because they are not only as we discussed its playing a major role in designing, but also in testing so, that no harm reaches the mankind. So, international atomic energy agency have a special code of behavior for the people, working in as well as for nuclear facility operating organizations.

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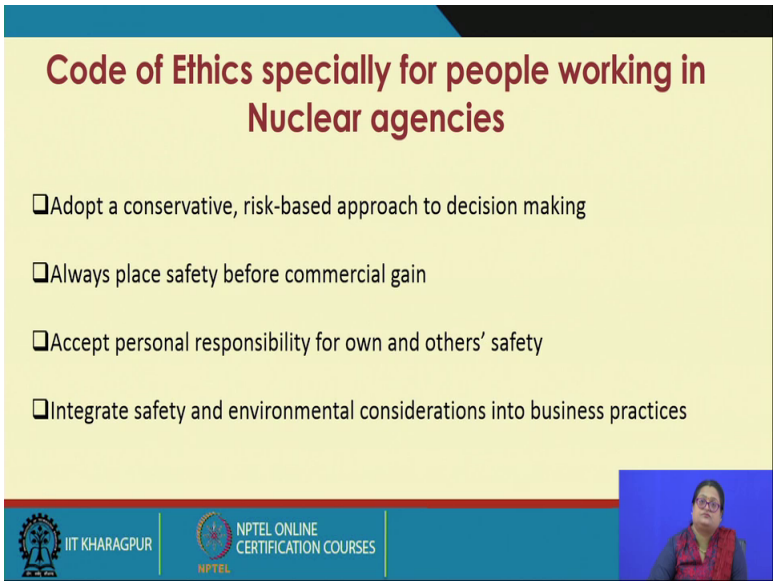

So, now, we are going to discuss code of ethics specifically for people working in nuclear agencies, adopt a conservative risk based approach to decision making. So, adopt a conservative risk based approach to decision making, why this is required, why we need to have a conservative risk based approach it is like. Because if we are committing an error and if you are taking a wrong decision, the if you are casual in a decision making.

If you are reaching our decision without doing much of testing, ignoring some of the negative may be results that is been showing and we are hurried up to say the to see the consequences, then what happens any wrong action, any error which goes unnoticed, which is maybe a either by commission, or by omission can be disastrous to the not only to mankind, but to the nature to the animal world as such.

So, to prevent that thing from happening so, people must adopt a conservative risk based approach to decision making, where they have to calculate the risks involved in every step every action that they are doing. So, safety needs to be placed before any commercial gain people have to own, their own responsibility they have to take ownership of their own response, their own safety and their safety of others, then the safety and environmental considerations need to be integrated into business practices. We cannot do any business without taking the safety and environmental considerations.

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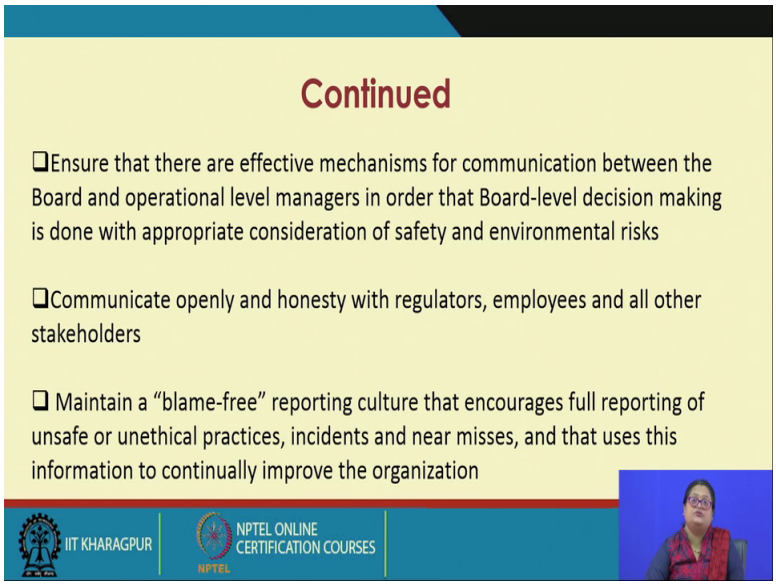

To it needs to be ensured that there is an effective mechanism for communication between the board and the operational level managers in order that the board level decision making, is done with appropriate consideration of the safety and environmental risk. Sometimes what happens those who are operating in the field, or in the shop floor, they get to know very intricacies of the problem very nitty gritty of the issues, which needs to be conveyed to people who are taking the like maybe strategic decisions at the board level.

So, there needs to be a lot of communication between the board and the operation level managers. So, that board level decision making is done, taking into consideration the safety and environmental risk of the operation level managers. Come another important factors communicate openly and honestly, with regulators employees and all other stakeholders. To maintain a blame free reporting culture to which encourages a full reporting of unsafe, or unethical practices incidents and near misses and that uses this information to continually improve the organization.

It is not you have not checked it is your fault, or you should have done it. So, these it is you this type of blaming should not be there. So, at this blame free environment would help in like reporting the full and, say for a unethical practices. So, that people can learn from those incidents people can understand, where they went wrong and make go for a self correction and improve the performance next time.

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So, openly share operating experience information, with other industry operation organizations, including benchmarking and make effective use of experiences for others, while respecting commercial confidentiality. So, we should be open to learn from others we should be open to learn from the best practices of other organization and, try to find out, where we are behind and try to improve what that issues participate objectively. And honestly in local national and global discussions and, policymaking processes regarding energy supply decisions.

So, they need to like participate in local national and global discussions on policy making and so, that they can take a decision about energy supply decisions. As we understand there is a lot of money transactions happening and, it involves a huge money for testing and maybe procuring etcetera, there could be questions of like bribery and corruption. And that is why it has been stated that bribery and corruption are not tolerated at any level or in any area of the organization.

So, it is not tolerated in like at any level and or in any area of the organization. So, it is a very strict this thing so, that the self like interest does not come in clash with the organizations interest, on the even the countries interest at large.

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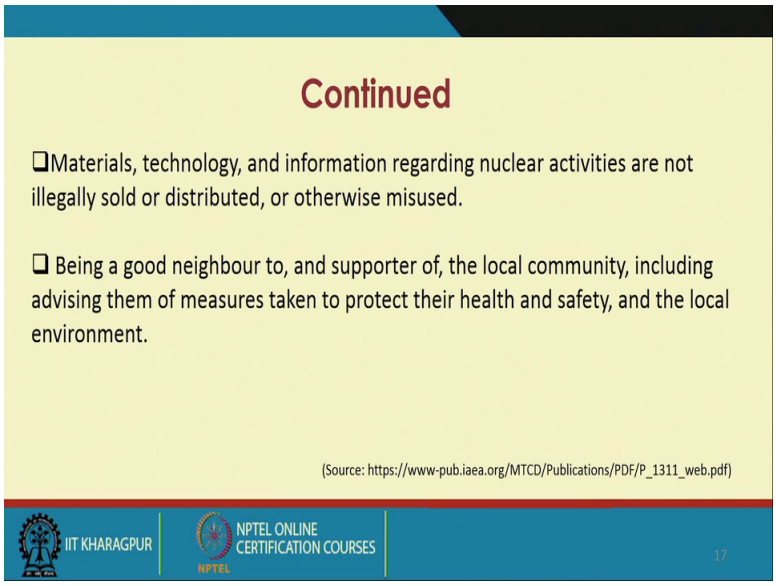

Materials technology and information regarding nuclear activities are not illegally sold, or distributed, or otherwise misused. Being a good neighbor to, and supporter of the local community including advising them to measures, taken to protect their health and safety and the local environment. So, if these are called like the these are the proactive measures. So, being a good neighbor to and supporter of the local community. So, that and again including like a advertising them, including advising them for measures to be taken to protect their health and safety and their local environment.

So, these are some of the ways in which like which talks of like nuclear ethics and, these are some of the ways which talks of the nuclear ethics and special requirements of like agencies who are working with the nuclear power nuclear energy and so, the responsibility for the safety of the community safety of the users and also how to protect for the environment at large.

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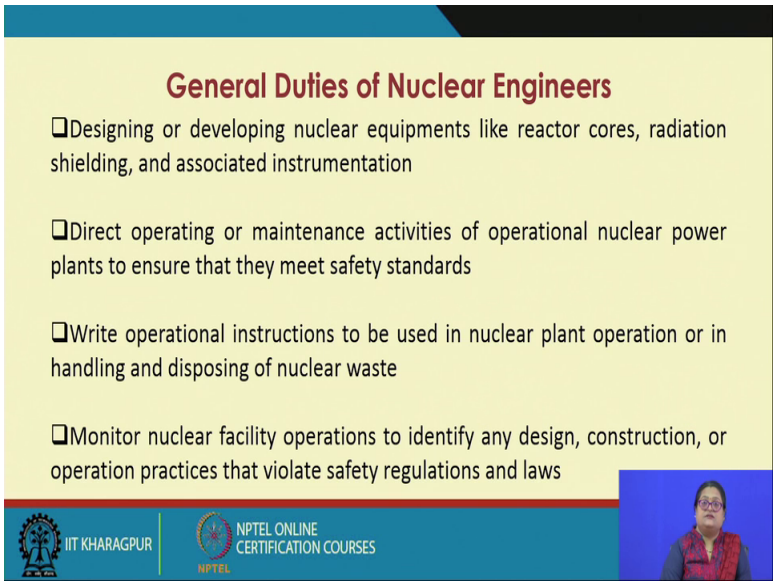

Now, we will talk of some general duties of nuclear engineers like designing, or developing nuclear equipments like reactors cores, radiation shielding and associated instrumentation, direct operating, or maintenance activities of operational nuclear power plants to ensure they meet safety standards right, operational instructions to be used in nuclear plant operator, or in handling and disposing of nuclear waste. Monitor nuclear facility operations to identify any design construction, or operation practices that violate safety regulations and laws.

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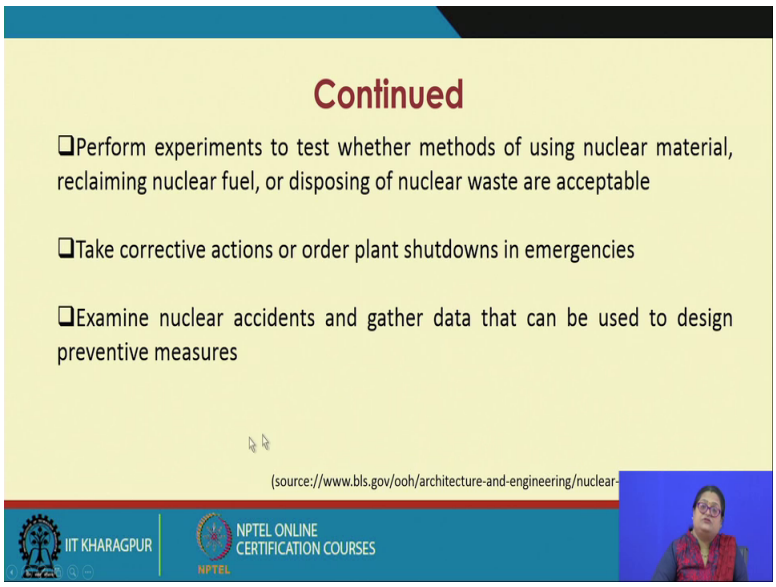

Perform experiment to test whether methods of using nuclear material reclaiming nuclear fuel, or disposing of nuclear waste are acceptable take corrective actions, or order plant shutdowns in emergencies. Examine nuclear accidents and gather data that can be used to design preventive measures. So, what we find is like some important points like what they need to do is to hand, for responsible handling of like responsible handling of nuclear like weapons, that we have or the products that we are making any clearly equipments etcetera.

So, another so, what are the general duties engineers have in terms of designing operating maintenance, to variety of the manuals and constant monitoring and, then coming to like doing experimentation for testing and taking our corrective actions after, like maybe some wrong things have been reported.

Or like of it can also talk of like plan shutdowns in emergencies, see what we see over here what you can feel over here, is the safety and security of the affected parties the beneficiaries the and the environment at large the long term effect on it are the major concerns which needs to be there. In the mind of the people and based on that they are going to take a decision about, what should be their role in at each of the important stages related to the nuclear equipments.

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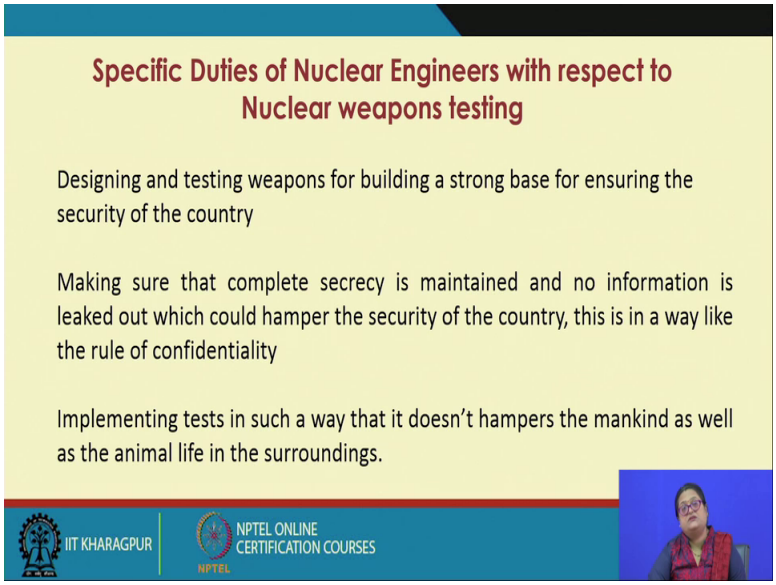

So, we will talk of some specific duties of nuclear engineers, with respect to nuclear weapon testing. Designing and testing weapons for building strong base for ensuring the

security of the country, making sure that the complete secrecy is maintained and no information is leaked out, which could hamper the security of the country. It is in a way like the rule of confidentiality, implementing tests in such a way that it does not hamper the mankind as well as the animal life in the surroundings.

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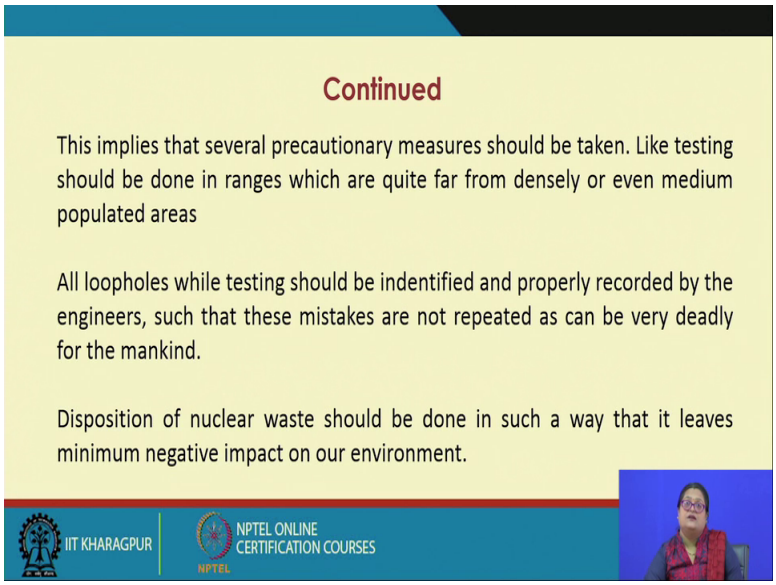

This implies that several precautionary measures should be taken, like testing should be done in ranges which are quite far from densely and even medium populated areas. All loopholes while testing should be identified and, properly recorded by the engineers such that these mistakes are not repeated as can be very deadly for the mankind. Disposition of nuclear waste could be done, in such a way that it leaves minimum negative impact on our environment.

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So, environment is a major concern over here and, we need to see like we are like disposal of the wastes are done in such a way, like it is not going to cause any harm to the environment at large. In the next session we are going to continue with the formation of the ethical policies and, how we are going to deal with the nuclear policies, what is the role of the different how we can look into nuclear deterrence from utilitarianism perspective and, rights and duties perspective and evaluate the whole scenario based on some cases.

Thank you.